EXPLORING THE EFFECT OF FEDERAL AND STATE-LEVEL SOCIOPOLITICAL PRESSURES ON ORGANIZATIONS

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EXPLORING THE EFFECT OF FEDERAL AND STATE-LEVEL SOCIOPOLITICAL PRESSURES ON ORGANIZATIONS

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While recent research has devoted much attention to the effect of local sociopolitical contexts on organizations, how society-wide institutional pressures—such as federal policies—affect the relationship between the two has rarely been discussed by organizational scholars. This is an important question because local and society-wide institutional environments concurrently shape organizational behavior. Building on the theory of political mediation and an institutional perspective, we argue that state-level sociopolitical influences on organizations will depend on the broader regulatory context at the federal level. We use data on coal-fired facilities' sulfur dioxide (SO2) emissions to address the question of when formal and informal local (state-level) sociopolitical contexts directly influence organizations' environmental performance. Our results show that when the national-level Acid Rain Program (ARP) was regarded as an effective regulation for controlling SO2 emissions (2003–2009), coal-fired facilities, as well as local government officials, key stakeholders, and social movement organizations (SMOs), attended to the implementation of the federal law. As a consequence, local sociopolitical contexts had a negligible effect on SO2 emissions by individual facilities. However, when stakeholders questioned the effectiveness of the ARP (2010–2011), the direct impact of SMOs and other sociopolitical contexts at the state level on facilities' emissions increased. From an institutional perspective, our results imply that local sociopolitical contexts are themselves embedded within the larger, society-wide, institutional environment, and that evaluating the direct influence of local sociopolitical pressures on organizations thus requires a more dynamic approach that includes consideration of institutional contexts at different levels in society.

BIOGRAPHICAL SKETCH

Joon Woo Sohn was born and raised in Seoul, South Korea. He received his Bachelor's degree in French Literature and Business Administration in 2006. After working in private sector for two years, Joon pursued his master's at Cornell University in Applied Statistics. He received hi M.S. in Organizational Behavior in 2013 and received his Ph.D. in the same field and school in May 2018. He recently accepted a postdoctoral fellowship position at Indiana University's Environmental Resilience Institute and the Kelly School of Business as a Green Economic Development Fellow.

To Jae Eun Lee, Evan Sohn, and Ithaca

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CHAPTER 1.
INTRODUCTION

Exploring the Influence of the Sociopolitical Contexts on Organizations

Recent management studies increasingly highlight the importance of theorizing how sociopolitical and cultural contexts at different levels concurrently shape organizational behaviors and outcomes (Marquis and Battilana, 2009; Marquis, Lounsbury, and Greenwood, 2011). Scholars in this field argue that organizational activities are often constrained or enabled by formal (regulatory) and informal (normative and cultural-cognitive) institutional infrastructures at the local and national levels. In this vein, while many empirical studies find evidence for the enduring influence of local institutional environments on organizations' decision-making processes and performance, the role of local institutional contexts has been described as a source of resistance to or compliance with pressures at different levels (Marquis and Lounsbury, 2007; Greenwood et al., 2011).

While recent research has devoted much attention to the effect of local sociopolitical contexts on organizations, how society-wide institutional pressures—such as federal policies—affect the relationship between the two has been somewhat oversimplified by organizational scholars. For example, scholars have found that organizations located in regions with progressive sociopolitical norms and values tend to engage more in prosocial or pro-environmental activities accepted at the federal level (Lee and Lounsbury, 2015; Marquis et al., 2016; Luo et al., 2017). Others have found that regional values affect firms' business strategies and entrepreneurial activities to meet local and federal normative demands (Eesley et al., 2016; Lounsbury, 2007; Marquis and Lounsbury, 2007). That is, prior studies imply that organizations are likely to

conform more closely to formalized rules and standards at the federal level when these standards are aligned with local institutional contexts.

This is an important criticism because local and society-wide institutional environments concurrently shape organizational behavior. In this vein, Zucker's (1986) work on institutional-based trust provides insights on how the relationship between institutional elements at different levels might be interactive, not additive. In other words, the relationship between local and society-wide institutional environments is not a simple dichotomy between whether they reinforce each other or not. According to Zucker, members of a society have different expectations and understandings of regulatory processes, depending on their shared norms and values. Rules and regulations define the validity of a specific action, while norms and values serve as a general framework for behavior shared by the members of a society. She argues that during the formalization process (e.g., during the process of enacting a regulation), diverse cultural and normative elements are "forced into a uniform pattern" (Zucker, 1986: 99). As a result, as the various stakeholders develop trust in formalized rules, they begin to rely more on institutionalized rules and regulations rather than on shared norms or traditional values. Zucker's results show that different institutional elements could substitute for each other, as an increase in one type of force may reduce the need for the other (Durkheim and Halls, 1984; Garfinkel, 1963).

Building on this perspective, in this dissertation I argue that state-level sociopolitical influences on organizations will depend on the broader regulatory context at the federal level. I use data on coal-fired facilities' sulfur dioxide (SO_2) emissions to address the question of when formal and informal local (state-level) sociopolitical contexts directly influence organizations' environmental performance. My results show that when the national-level Acid Rain Program

(ARP) was regarded as an effective regulation for controlling SO_2 emissions (2003–2009), coal-fired facilities, as well as local government officials, key stakeholders, and social movement organizations (SMOs), attended to the implementation of the federal law. As a consequence, local sociopolitical contexts had a negligible effect on SO_2 emissions by individual facilities. However, when stakeholders questioned the effectiveness of the ARP (2010–2011), the direct impact of SMOs and other sociopolitical contexts at the state level on facilities' emissions increased. From an institutional perspective, my results imply that local sociopolitical contexts are themselves embedded within the larger, society-wide institutional environment, and that evaluating the direct influence of local sociopolitical pressures on organizations thus requires a more dynamic approach that includes consideration of institutional contexts at different levels in society.

1.1 Local (State-level) Sociopolitical Contexts as an Institutional Order

Neo-institutional theory has provided valuable insights into how organizations operating in a given institutional environment and facing sociopolitical and cultural pressures come to resemble one another by adopting the same legitimated formal structure (Meyer and Rowan, 1977; DiMaggio and Powell, 1983; Boiral, 2003). In this vein, some early scholars argued that organizational forms would become homogeneous regardless of geographic boundaries because of the development of modern technologies and globalization trends that increased inter-organizational influences (Meyer, Ramirez, and Soysal, 1992; Marquis and Battilana, 2009). However, recent studies continue to show that local institutional contexts have an enduring influence on organizational activities (Sine et al., 2005; Freeman and Audia, 2006; Marquis and Battilana, 2009; Hiatt et al., 2009; Greenwood et al., 2011; Marquis, Lounsbury, and

Greenwood, 2011; Lee and Lounsbury, 2015). According to these studies, organizational activities are often constrained by formal (regulatory) and informal (normative and cultural-cognitive) institutional environments at the local level.

Organizations conform to local regulatory pressure because government entities have the power to sanction them for noncompliance through laws and court rulings (Scott, 1995). For example, Guthrie and Roth (1999a, 1999b) found that firms operating in a region where the local judiciary supported the federal equal employment law had more female CEOs. They argue that these organizations faced stronger pressures to promote women to higher managerial positions because of local enforcement. Thus, local government actors can either strengthen or weaken the compliance of locally based organizations with national policies by shaping local actors' social and material interests.

In addition to the local regulatory environment, informal institutional elements at the state level such as shared norms and values also constrain or enable locally based organizations by setting the standard that is commonly accepted in the region (Marquis et al., 2007). These standards are created by local stakeholders and guide community members as to "what is right to do around here." Previous studies on the role of local communities have documented how normative pressures vary by region (Marquis, 2003; Lounsbury, 2007; Marquis et al., 2013). For instance, a few scholars have illustrated how local relational networks and foundations function as communications channels among their members, who develop a common understanding of how legitimate organizations should operate (Galaskiewicz 1991; Campbell, 2007; Marquis et al., 2007; Marquis et al., 2013). These networks and local institutions, such as upper-class social clubs, NGOs, local community foundations, and professional and industry associations, provide a normative basis for adopting particular organizational practices, structures, and forms based on

their expertise and credibility (Galaskiewicz 1991; Campbell, 2007; Marquis and Lounsbury, 2007; Marquis et al., 2013).

While these studies show the enduring influence of local normative actors on organizations, we still lack a full understanding of how the sociopolitical environment at the societal (i.e., at the upper) level interacts with local pressures to concurrently shape organizational outcomes. Studies examining the role of regional sociopolitical contexts have observed firm behaviors, such as conserving the environment or engaging in corporate social responsibility and philanthropic activities, which do not have sufficient stakeholder acceptance or consensus at the federal level (Marquis et al., 2007; Marquis et al., 2011). Similarly, others have examined how organizations react to federal regulations or norms that require voluntary compliance (Lee and Lounsbury, 2015). For example, Lee and Lounsbury (2015) investigated how organizations responded to the Toxic Release Inventory (TRI), a reporting standard monitored by the EPA, which mandated that companies collect and report data on the release of certain toxic chemicals. Given the lack of consensus at the federal level with respect to the coercive mechanism, these studies were adequate for observing local influences on the level of compliance but not for examining how both levels of sociopolitical contexts concurrently shape organizational behavior.

Despite their valuable insights, prior studies overlooked the possibility that the local institutional environment both affects and is affected by federal regulatory standards. Without addressing this gap, scholars may implicitly assume that the association between local institutional context and federal policy is additive rather than interactive, as empirical studies increasingly show how the local institutional context acts as a source of resistance to or compliance with a policy or a practice at the federal level. Considering both contexts

simultaneously in organizational research leads us to a simple research question: Is the relationship between federal and local institutional pressures a simple dichotomy of reinforcement versus contradiction, as implicitly assumed in the existing literature? Or is the relationship more interactive and dynamic? For example, organizations might pay more attention to one context than the other (local vs. federal). The purpose of this dissertation is to delve deeper into this question.

1.2 Research Context: The Acid Rain Program

To solve my theoretical question, in chapter two I present the research setting of this dissertation – the Acid Rain Program (ARP). The ARP was the first market-based policy adopted in the United States, which was initiated under Title IV of the 1990 Clean Air Act Amendments. During this period, previous command-and-control policies were criticized for two reasons: first, mainstream economists argued that monitoring activities such as pollution increase or nature destruction by a centralized governmental institution is not cost-effective. Furthermore, policy makers in favor of free-market principles believed that imposing identical standards on targeted actors would fail to incentivize these actors to comply beyond what is required by the regulation (Coase, 1960).

In keeping with neoliberal economic policies incorporating market mechanisms, the ARP was enacted with the goal of reducing acidic compounds created from burning fossil fuels by 45 percent compared with 1980 levels under the monitoring of the Environmental Protection Agency (EPA). This program involved setting a permanent cap on the total amounts of pollutants (mainly sulfur dioxide - SO_2) and allowed market participants to trade pollutant allowances. Each coal-fired utility was assigned a pollution allowance based on past performance; if their

pollution level was below the allowance, they could sell their surplus allowance to firms that exceeded their allowance. This program was thus intended to create monetary incentives to reduce pollution (e.g., by installing filters or using low-sulfur coal) (Goulder, 2013; Sovacool, 2011).

In the second chapter, I view the ARP through a sociological lens. From the 1970s, free market ideology was viewed as an icon of modern capitalism and a solution to social problems (Backhouse, 2005). This led many U.S. policy-makers and members of the public to accept the idea of using market-based solutions to fix environmental problems. The ARP earned near-unanimous support in the Senate and House of Representatives, authorizing the EPA to monitor and promote the trading market (Ellerman et al., 2000). Social movement organizations which initially opposed the market-based policy (e.g. the Sierra Club) eventually participated actively in the market and used it as a strategy to accomplish further reduction of emissions (Chan et al., 2012; Ellerman et al., 2000). When the program was initiated, these proxies provided confidence among facilities and attracted other actors outside the regulated field to participate in the market, raising the price of an allowance. As a result, the reduction in emissions was mostly achieved through market mechanisms supported by the Acid Rain Program (Ellerman & Montero, 2007; Chan et al., 2012; Schmalensee and Stavins, 2013).

However, when a series of court rulings substantially vacated a major trading rule of the ARP (after 2010), the confidence in the ability of market mechanisms to pressure facilities to reduce pollution was also vacated; hence, the operational stability and monetary incentives gained from allowances no longer existed. Interestingly, the levels of emissions continued to drop even after the legitimacy of the allowance market was legally challenged. That is, the policy continued to have an effect even after it was vacated by court rulings, which led prices of

allowances to drop to nearly zero. Some argued that the effectiveness of the program was an outcome of the "cap" rather than the "trade" because the program's long-term goal of reducing total amounts of annual emissions was accomplished by 2007 (Chan et al., 2012; Evans & Woodward, 2013; Schmalensee & Stavins, 2013). This phenomenon is puzzling since, from an economic standpoint, the drop-in allowance price could have incentivized fossil-fuel power plants to increase SO_2 emissions as the marginal cost of reducing emissions decreased. This led many scholars to suggest various potential factors that may have led to the continued impact of the earlier policy. In addition to various economic and technological factors, I attempt to explain how formal and informal sociopolitical influences at the state level contributed to the additional drop in emissions when the validity of the federal law was questioned.

1.3 Empirical Chapter: When Do Local Sociopolitical Contexts Matter?

Although many recent studies have acknowledged the impact of regional institutional pressures on organizational outcomes, our understanding of how the interaction between global (upper-level) and local pressures shapes organizational decisions is limited. In this chapter, I examine how the strength of local normative pressure on organizations changes depending on the perceived effectiveness of the regulation at the upper-level (global or federal). Using the context of the Acid Rain Program (ARP), the first market-based environmental policy in the U.S., I show that local normative pressures created by local social movement organizations and citizens' political ideology had a greater impact on coal-fired facilities' emissions of pollution when the validity of the federal regulation was disputed by stakeholders (2010-2011). That is, when the federal law did not serve as an overarching regulatory framework, local normative influences replaced the role of the federal regulation.

Here, I present two mechanisms that induced coal-fired facilities to pay closer attention to local sociopolitical contexts when federal regulations were contested. First, I suggest that the lack of validity associated with the federal law shifted the attention of local governments, SMOs, and key stakeholders from the ARP to local pro-environmental initiatives. In this regard, local sociopolitical influences on coal-fired facilities increased to maintain the objectives of the questionable federal policy. In particular, in this chapter I investigate how the influence of the Sierra Club and state-level environmental policies (e.g. Renewable Portfolio Standards) on facilities' SO_2 emissions changed before and after the vacating of major trading rules under the ARP.

Furthermore, I argue that coal-fired facilities lost their legal protections related to SO_2 emissions at the federal level when the ARP was being challenged. While the purpose of federal regulation is to control target organizations' activities, compliance also provides a signal of "good faith" efforts to address problems (Meyer and Rowan, 1977; Tolbert and Zucker, 1996). That is, in theory coal-fired facilities could maintain their operational stability to some extent by securing their rights to pollute regardless of pro-environmental pressures at the state level. As a result, I contend that facilities would start to consider local regulative and normative pressures as federal regulations could no longer secure their own legitimacy and stable operation.

To test my hypotheses, I use data from the EPA on emissions from coal-fired power plants in the U.S. from 2003 to 2011, and on rates of participation in the purchase and sale of pollution allowances. I combine these data with state-level characteristics from multiple sources. I divide my data into two different time periods: 2003-2009, when the policy was regarded as an effective tool, and 2010-2011, after the government decided to drop major trading rules from the ARP. Using a multilevel analysis, I found that the size of environmental movement

organizations, the political ideology, and regulatory initiatives in a state are significantly related to reduction in SO_2 emissions by plants in that state only after the validity of the ARP was challenged. My results imply that the relationship between local and federal sociopolitical contexts might be substitutive rather than additive.

CHAPTER 2.

RESEARCH CONTEXT: LEARNING FROM THE COLLAPSE OF THE ACID RAIN PROGRAM

Introduction

In keeping with "free market" ideology, the U.S. Congress passed the Clean Air Act Amendments of 1990 establishing the Acid Rain Program (ARP), which was aimed at reducing acid rain pollutants using market-based mechanisms at the federal level. This "grand policy experiment" (Stavins, 1998; p.103) was designed to reduce the level of sulfur dioxide (SO_2) emissions by creating a market for pollution permits (also known as allowances). In theory, this market would incentivize polluters to decrease the level of emissions. When the new law was implemented, the idea of the market as an effective and efficient regulatory mechanism for controlling pollution emissions was strongly supported by local governments and non-governmental organizations, including environmental activists who had initially opposed the market-based policy during the early 1980s (Chan et al., 2012; Schmalensee and Stavins, 2013).

The perceived effectiveness of the policy, however, was first threatened between 2008 and 2009 when the U.S. Court of Appeals for the District of Columbia (D.C.) Circuit invalidated a new rule (the Clean Air Interstate Rule-CAIR) introduced by the Environmental Protection Agency (EPA) in an attempt to strengthen the ARP. The new rule was intended to tighten the emission standards for 28 eastern states and the District of Columbia, which EPA considered to be heavy polluters. After multiple failed revisions and legal battles, in 2010 the Obama administration finally dropped the new rule from the ARP and the price of an allowance became significantly lower than that of operating filters (Chan et al., 2012; Evans and Woodward, 2013).

For coal-fired facilities, this meant that purchasing and using allowances in order to pollute was cheaper than using filters to reduce the emissions of the toxic gas. As a consequence, the EPA introduced another revised rule in 2012, but the idea of this market-based solution as an effective federal environmental policy continued to be challenged by stakeholders and scholars (Schmalensee and Stavins, 2013).

In this chapter, I provide a general background on the ARP and summarize the sociopolitical context of its formulation, enactment, and implementation at the federal level. In particular, I investigate how formal (e.g. government officials, policy makers) and informal (e.g. NGOs, social movement organizations) sociopolitical actors responded to a series of events associated with the ARP.

2.1 The ARP: A Cap-and-Trade Approach to Pollution Control

Traditional regulations impose uniform requirements on all of the actors within formal guidelines subject to the regulatory programs. For example, countries such as South Korea use centralized pollution control laws which impose firms to comply with methods and schedules designated by the government. Tripp and Dudek (1989: 369) criticized this command and control system because "all sources face a rigid ceiling [, and as a result,] firms have no incentive to reduce discharges below the prescribed limits." Moreover, these scholars argued that the lack of incentives would lead firms to overlook innovative approaches for reducing toxic materials more than their legal requirements. Others contended that under the traditional system, governments would experience high costs for monitoring targeted organizations (Ellerman, 2000).

Following the trend of liberalization and deregulation in the 1980s, the use of market-based policies such as cap-and-trade systems, credits, and transferable property rights grew

considerably. Here, the idea is that once the means of compliance is capitalized, the price mechanism adequately incentivizes market participants to adequately preserve public goods. The incentive structure allows profit-driven actors to be innovative by searching for the best methods of compliance (Coase, 1960). According to economists, these policies are efficient for the government because the role of the state is to simply establish the basis of market transactions for public goods by ensuring property rights, voluntary exchange, and common law liability rules (Anderson, 2004). As a result, during this period, policymakers who embraced the free market beliefs increasingly accepted the idea of market-based policies as a means of regulating logging and forestry (Tripp and Dudek, 1989), restoring ecosystems (Hahn and Hester, 1989; Foster and Hahn, 1995; Klier et al., 1997), setting quotas on tobacco and dairy products (McCann, 1996), and even controlling population growth (Daly, 1996).

In line with many market-based policies, the ARP uses a "cap and trade" approach. First, the government sets a limit, which is the "cap," on the total amounts of pollutants for a certain period. The government then issues "allowances" or "permits" to emitters such as coal-fired power plants. Some allowances are distributed to emitters free of charge and some are sold for a certain price. The total number of allowances created in each year is always identical to the cap. Then, entities subjected to the program must surrender allowances equivalent to their actual emissions to the government at the end of the compliance period. If they fail to surrender the appropriate amount of allowances, the government imposes legal sanctions or monetary penalties on them.

Polluters, along with other market participants could buy allowances on the market, sell or transfer their allowances to other parties, or reserve (bank) them for future use. The "trading" component is designed to encourage power plants to respond strategically to the new legal

standards, because the increased marginal cost of reducing emissions (i.e., allowance price increases) should incentivize emitters to search for alternative ways (e.g. using filters) to decrease emissions. In this respect, reducing emissions using a market-based system provides regulated sources with the flexibility to select the most cost-effective approach to reduce emissions and has proven to be a highly effective way to achieve reduction in emissions, meet environmental goals, and improve human health (Evans and Woodward, 2013).

In short, unlike a traditional command-and-control system that mandates the same means of legal compliance across targeted actors, the motivation for a market-based policy is to induce regulated actors' moral behavior by aligning monetary incentives with socially desired outcomes such as preserving public goods. In doing so, the ARP involved setting a permanent cap on the total amounts of pollutants (mainly sulfur dioxide - SO_2) and allowing market participants to freely trade their allowances. Market activities associated with the program were intended to provide operational flexibility for facilities, which were assumed to be rational entities, to search for cost-effective ways to generate energy while reducing acid rain pollutants. Since the price of an allowance served as a key criterion for selecting abatement strategies, maintaining market confidence was a critical factor for achieving policy objectives (Chan et al., 2012; Ellerman, 2000; Schmalensee and Stavins, 2013). In the next section, based on the historical context of the ARP, I investigate how the value of an allowance was affected by various sociopolitical actors associated with the policy.

2.2.1 A Brief History of the ARP and the Clean Air Interstate Rule (1995~2011)

Since the 1970s, policy makers have increasingly viewed the market as a solution to a variety of social problems (Backhouse, 2005), including environmental pollution. In response to the

concerns raised over acid rain, the U.S. Congress passed the Clean Air Act Amendments in 1990. Under Title IV of the Act, power generators using fossil fuels were required to surrender to the EPA one allowance for each ton of sulfur dioxide (SO_2) emitted. SO_2, a gas emitted mainly by facilities burning fossil fuels, is known for contributing to the acidification of forests and lakes. It is also known to precede the forming of particulates, which are a serious threat to public health and the environment. To preserve the environment, the SO_2 trading program, which is the first market-based environmental policy in the U.S., was implemented under the supervision of the Environmental Protection Agency (EPA). The EPA acted as the regulator of this newly constructed market, strictly monitoring the emissions rate of each power plant and securing the price value of an allowance to establish confidence in the market.

The objective of the program was to limit annual emissions from fossil-fuel-based power plants to 8.95 million tons by 2010, a 50 percent drop from the level of SO_2 emitted in 1980, by capitalizing the right to emit this pollutant. The program was implemented in two phases so that older facilities with a lack of equipment associated with SO_2 reduction technology could adjust to the new regulatory environment. Phase I began in 1995, affecting the 110 dirtiest SO_2-generating facilities. The remaining coal-fired power plants came under Phase 2, which began in 2000.

The EPA set an overall cap on SO_2 emissions for each facility based on the historical operational records. At the end of the year, facilities were required to surrender one allowance for each ton of SO_2 produced. If they had unused allowances, these facilities could then either bank them for future needs or participate in the trading market. Market participants comprised all the buyers and sellers who could potentially influence the price of an allowance: any individual persons, state agencies, corporations, brokers, environmental groups, and other NGOs. The "trading" component was aimed to encourage power plants to strategically respond to the new

legal standards because the increased marginal cost of reducing emissions (i.e. allowance price increases) would incentivize dirty power plants to search for alternative ways to decrease emissions.

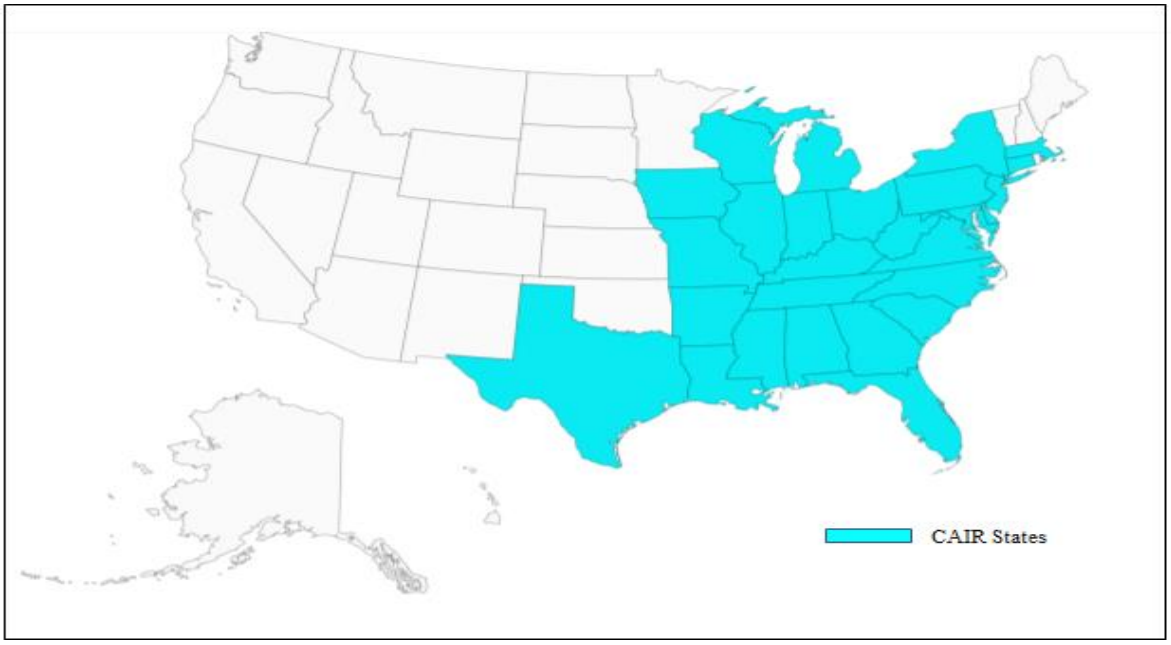
Although controversial in the beginning, the ARP earned near-unanimous support in the Senate and House of Representatives, which authorized the EPA to monitor and promote the trading market[1] (Ellerman, 2000; Rich, 2016). Most environmental movement organizations initially opposed the market-based policy as they viewed allowances as purchasing the right to pollute. In order to gain support from activists, the Reagan administration included major environmental groups (e.g. the Acid Rain Retirement Fund, the Environmental Defense Fund, the Sierra Club, and so forth) in the regulatory process (United Press International - Washington, Oct 18. 1983). Eventually by 1990, the program was accepted by the leading environmental movement organizations including the Sierra Club, the Izaak Walton League, Friends of the Earth, the Environmental Defense Fund and the U.S. Public Interest Research Group (Maclean, Chicago Tribune, April 4, 1987[2]). This led other environmental movement organizations to support the program and even participate actively in the market, using the purchase of allowances as a strategy to accomplish further reductions of emissions (Chan et al., 2012; Schmalensee and Stavins, 2013).

In May 2005, to further tighten the SO_2 cap, the George W. Bush administration proposed the Clean Air Interstate Rule (CAIR), a new trading program built on the ARP, with the purpose of dropping the cap on SO_2 emissions to 70 percent below the 2003 emissions level. In doing so,

[1] The conference bill passed the House by a vote of 401 to 25 and passed the Senate 89 to 10. The law was then signed by President Bush on November 15, 1990.

[2] The actual article can be found at http://articles.chicagotribune.com/1987-04-04/news/8701250779_1_high-sulfur-coal-acid-rain-clean-coal).

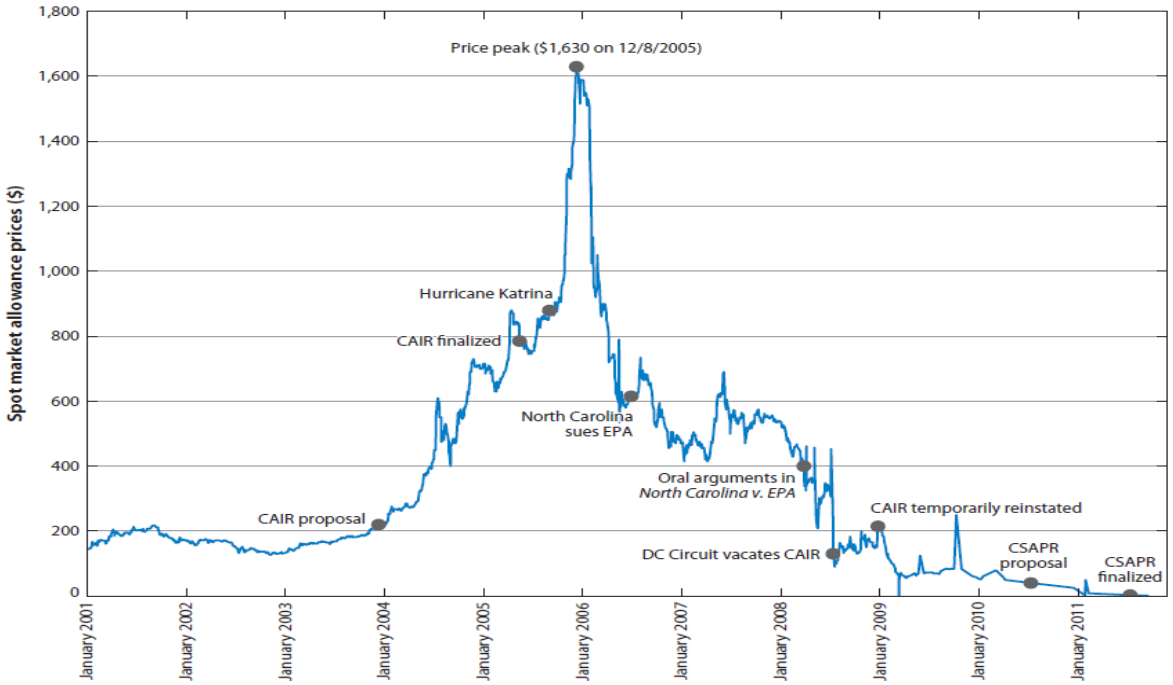
the EPA applied more stringent emission "caps" on eastern states that generated most of the visibility-reducing pollutants[3] (Palmer and Evans 2009). Before the CAIR, facilities could pollute one ton of SO_2 per each allowance regardless of their location. The new rule, however, required plants located in the 28 dirtier states (as shown in Figure 1) to surrender two allowances for every ton of SO_2 emissions. As a consequence, the allowance price rose further, from $600 per ton to $1,578 per ton in 2005 (as shown in Figure 2).



Source: EPA Web Archive (https://archive.epa.gov/airmarkets/programs/cair/web/html/index.html)

Figure 1. 28 states under the Clean Air Interstate Rule (CAIR).

[3] Pollutants that reduce visibility include fine particulate matter (PM2.5) and compounds which contribute to PM2.5 formation, such as nitrogen oxides (NOx), sulfur dioxides (SO_2), ammonia and under certain conditions volatile organic compounds. For more information, visit http://www3.epa.gov/visibility/fs_2005_6_15.html.



Source: Evans and Woodward (2013).

Figure 2. Spot market prices for SO_2 allowances (2001–2011).

After the CAIR was announced, however, a number of utilities and the state of North Carolina challenged the EPA (North Carolina v. EPA- No. 05-1244, D.C. Cir. July 11, 2008) in the U.S. Court of Appeals for the District of Columbia (D.C.) Circuit (Evans and Woodward, 2013; Schmalensee and Stavins, 2013). These parties raised questions about the EPA's methods of managing the trading program, and the ways in which the EPA selected the 28 states. Additionally, some facilities questioned the EPA's methods of distributing allowances using auction mechanism as the EPA mandated facilities to mandatorily submit 2.8 percent of the total amount of allowances received in a given year t[4] to secure sufficient amount of allowances. As a

[4] In particular, these facilities were questioning the use of auction annually held by the EPA. To supply the auctions with allowances, the EPA held an Auction Allowance Reserve of approximately 2.8 percent of the total annual allowances allocated to all units in March of each year. The purpose of the allowance auction was to set the market value of an allowance in a given year t for all market participants, including coal-fired facilities. To these facilities,

result, during this period, these facilities and other stakeholders referred to the program in derogatory terms such as *"cap and tax"* rather than "*cap and trade*," questioning the purpose of the market-based policy (Schmalensee and Stavins, 2013). As shown in Figure 2, the price of an allowance started to drop in 2006 due to the legal uncertainty raised by the law suits.

In 2008, the CAIR was initially vacated (struck down) by the D.C. Circuit, which asked the EPA for a major revision. However, the court decided to remain the CAIR until the EPA could come up with a new rule. The EPA filed for a rehearing of the DC Circuit's decision to vacate the CAIR, but the Obama administration finally decided to drop the CAIR from the ARP and come up with new rules in 2010 (Schmalensee and Stavins, 2013). In 2012, the Obama administration finalized the wording of a new rule (known as the Cross-State Air Pollution Rule-CSAPR) to replace the CAIR. After a number legal challenges associated with the CSAPR by state governments, the CAIR was again temporarily implemented.

In 2010, multiple failed revisions had threatened stakeholder support for the ARP (Chan et al., 2012; Evans and Woodward, 2013). As a consequence, the D.C. court questioned the EPA's ability to improve market-based solutions. By failing to resolve issues raised, the EPA appeared incompetent to market participants which also influenced stakeholders' confidence in the trading market; in 2008, the average price of an allowance was $327 per ton. When the CAIR was temporarily adopted in 2010, the allowance price dropped to $38 per ton. In 2011, the per-ton price went down even further, to less than two dollars. This was significantly lower than that of operating the cheapest filter ($50 ~ $100/ton) used to reduce SO_2 emissions. For coal-fired facilities, this meant that consuming allowances could be more economical than operating filters.

submitting 2.8 percent of the total annual allowances was viewed as a "tax." For more information, please visit http://www.epa.gov/airmarkets/so2-allowance-auctions.

This new reality ran against the basic purpose of the policy which was to reduce, not to incentivize, SO_2 emissions. In other words, the series of revision failures threatened the legitimacy of market mechanisms and the perceived value of an allowance (Evans and Woodword, 2013; Schmalensee and Stavins, 2013). In the next section, I discuss in depth about the failure of the CAIR and the EPA's attempt to mend the broken policy.

2.2.2. The failure of the CAIR

When the ARP was initially enacted, the emphasis was on protecting the environment from acidification. In fact, the program's beneficial impact on human health such as lung disease was completely unanticipated (Evans and Woodward, 2013; Schmalensee and Stavins, 2013). As a result, the cost-benefit analysis of the program required major revisions. In order to protect public health and the environment, the EPA promulgated the CAIR under the authority of the Clean Air Act (CAA) Title I.[5] In doing so, based on monitoring data, the EPA designated states (as shown in Figure 1) that contributed to the transmission of fine particulate matter ($PM_{2.5}$),[6] which causes various lung diseases. Then, the CAIR SO_2 program required all facilities operating in the selected states to surrender two allowances for one ton of emissions starting in 2010 and 2.5 allowances for one ton of emissions for the affected region starting in 2015. The earlier

[5] In particular, section 110(a)(2)(D)(i)(I) of Title I of the Clean Air Act states as follows;
(i) . . .any source or other type of emissions activity within the State from emitting any air pollutant in amounts which will—
(I) contribute significantly to nonattainment in, or interfere with maintenance by, any other State with respect to any such national primary or secondary ambient air quality standard……

[6] $PM_{2.5}$, also known as fine particulate matter, is a byproduct of SO_2 emissions.

allowance currency (1 allowance: 1 ton of emissions) was maintained for those states that were not affected by the new rule.

The new rule created confusions among local state governments, policy makers, and coal-fired facilities. In 2006, as previously mentioned, North Carolina sued the EPA in the D.C. Circuit because the CAIR was not stringent enough to protect the air quality of North Carolina from pollution generated in nearby states such as Georgia (Boyle, 2008). During the trial, the court found that the CAIR had a few critical flaws. First, the court questioned the EPA's methods for setting up a new cap. The court stated that the CAIR SO_2 emission caps were "*arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law* (North Carolina v. EPA, 531 F.3d 896, D.C. Cir. 2008: p 12.)." That is, the court indicated that the EPA's estimation for setting the new cap was unclear and its effectiveness lacked logical validity[7].

Additionally, the D.C. Circuit also stated that the EPA did not have the legitimate authority and the adequate knowledge to adjust the value of allowances (Evans and Woodward, 2013). The court confirmed that the CAA, a federal law designed to control air pollution on a national level, did not confer any authority on the EPA to limit or terminate SO_2 allowances[8] issued under Title IV. In other words, the EPA could not modify an interstate allowance trading system without the approval of Congress. For stakeholders, this meant that the EPA failed to present the optimal value of an allowance for emissions to prevent the spread of acid rain pollutants across states.

[7] The court ruling states that "it is unclear how the quantitative number of allowances created by 1990 legislation to address one substance, acid rain, could be relevant to 2015 levels of an air pollutant, $PM_{2.5}$." The court also noted that "[a]part from the arbitrary Title IV baseline, the EPA has insufficiently explained how it arrived at the 50% and 65% reduction figures (North Carolina v. EPA, 531 F.3d 896, D.C. Cir. 2008, p. 36)."

[8] "So too here: no statute confers authority on EPA to terminate or limit Title IV(SO_2) allowances, and the EPA thus has none (North Carolina v. EPA, 531 F.3d 896, D.C. Cir. 2008, p. 44)"

In vacating the CAIR, the court ruling finalized that "the EPA's approach —region wide caps with no state-specific quantitative contribution determinations or emissions requirements— is fundamentally flawed" and that the EPA must "redo its analysis from the ground up" (North Carolina v. EPA, 531 F.3d 896, D.C. Cir. 2008: p. 59). The court's decision was unexpected by local stakeholders and the state of North Carolina who initially sued the EPA as it was inconsistent with a previous holding (Tait, 2009). During this period the EPA appealed to the Supreme Court for review of this decision. When the Obama administration decided drop the appeal in 2010, market uncertainties increased as the statement signaled to market participants that "the government can undo what it created" (Schmalensee and Stavins, 2013; p. 113). When the court decided to vacate the CAIR, the price of an allowance immediately fell by 62 percent[9] (as shown in Figure 2).

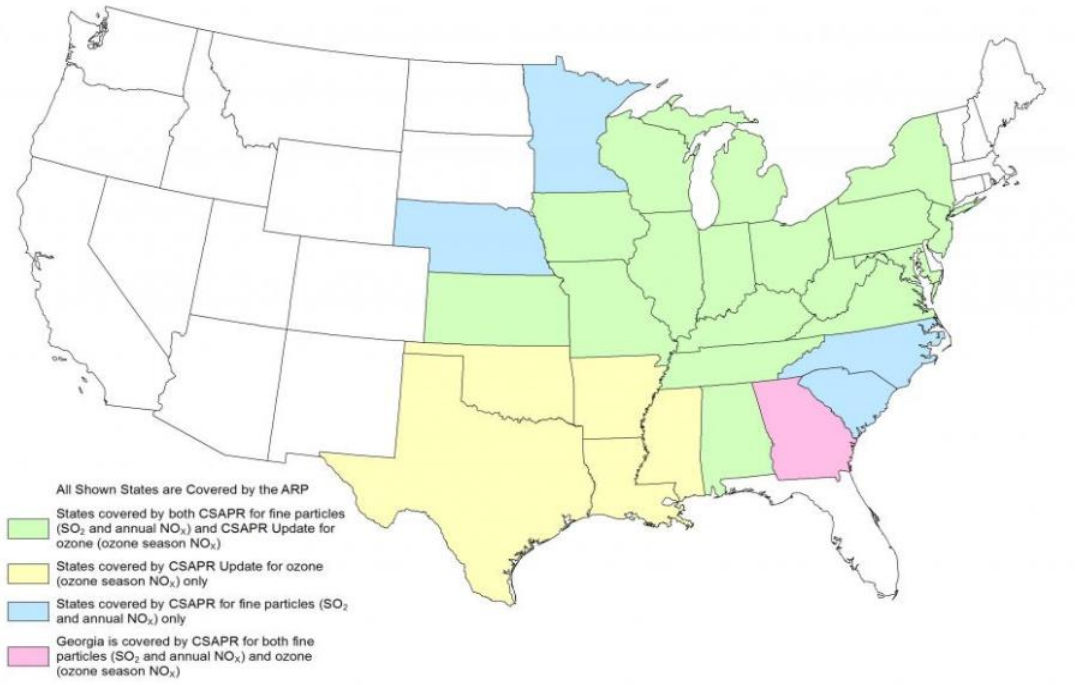
2.2.3 After the CAIR- Cross State Air Pollution Rule (CSAPR)

While accepting the finding of critical flaws of the CAIR, the EPA requested the Court not to wholly vacate the rules because approaches used in the CAIR were partly in line with previous court rulings[10] associated with inter-state transmission of pollutants (Evans & Woodward, 2013). However, in April 2010 the Obama administration decided to drop the appeal of the ruling, and the Court allowed the CAIR to come into effect until the EPA issued a replacement regulation that addressed all the concerns above (Bravender 2010; Schmalensee and Stavins, 2013).

[9] On that day (July 11, 2008), the price fell from $327 to $124 (Evans and Woodward, 2013).

[10] Michigan v. EPA (213 F.3d 663, (D.C. Cir. 2000)), Virginia v. EPA (108 F.3d 1397 (D.C. Cir. 1997))

On July 6, 2011 the EPA finalized the Cross-State Air Pollution Rule (CSAPR), which attempted to minimize air pollutions from states that affect other states' air quality. As in the CAIR, the new rule also required selected states (as shown in Figure 3) to limit emissions based on natural environments (e.g. wind directions) and standards set at the state level. That is, the annual SO_2 cap varied across 23 states affected by the rule; "7 states require relatively little emissions reductions to bring downwind monitors into attainment. The other 16 states require greater emissions reductions before a sufficient number of downwind monitors are forecast to come into attainment (Evans and Woodward, 2013; p. 336)." Moreover, allowance transfer was limited for those facilities operating in the 16 states through complex legal procedures. As a consequence, the idea of using federal market mechanisms, which allowed unlimited allowance transactions across states, as a policy instrument to reduce SO_2 emissions ended.



Source: EPA's Clean Air Markets (2017). https://www.epa.gov/airmarkets/map-states-covered-csapr

Figure 3. Map of states covered by CSAPR

As shown in Table 1, the CSAPR also went through major revisions between 2011 and 2017. During this period, the legal battles between the EPA and the penalized states by the CSAPR hindered the implementation of the program. To maintain the air quality at the federal level, the CAIR remained in effect until the court accepted the revision in 2016. Nonetheless, the

Table 1. Series of events associated with Cross State Air Pollution Rule (CSAPR)

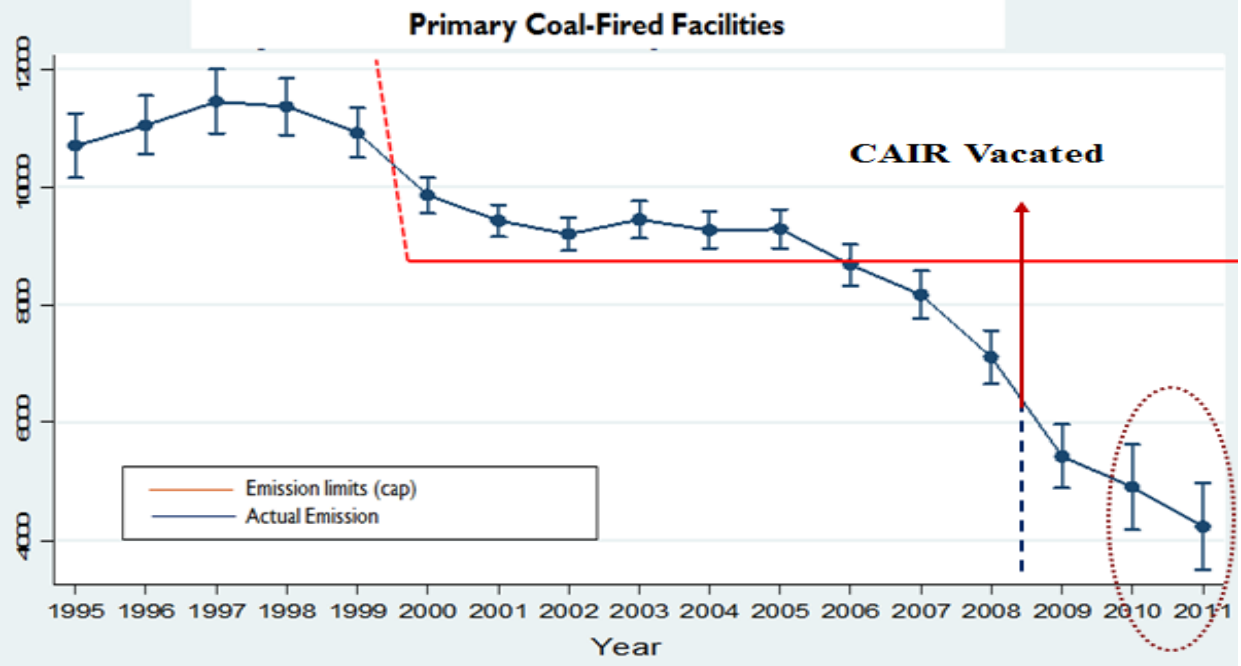
Date	Events
6-Jul-2011	The EPA finalized the CSAPR in order to replace the Clean Air Interstate Rule (CAIR). The new rule required eastern and central states to prevent emissions that may cross state boarders.
5-Jun-2012	The EPA reviewed and issued several adjustments to the rule.
21-Aug-2012	D.C. Circuit Court of Appeals overturned the CSAPR. **CAIR** remained in place.
Jun- 2013	14 states challenged the Cross State Air Pollution Rule (CSAPR) in federal court: Alabama, Florida, Georgia, Indiana, Kansas, Louisiana, Michigan, Nebraska, Ohio, Oklahoma, South Carolina, Texas, West Virginia, and Wisconsin. The states were joined by several labor groups, such as the United Mine Workers of America, and electric utility groups, such as the Utility Air Regulatory Group[11].
29-Apr-2014	The United States Supreme Court reversed the decision of the D. C. Circuit Court of Appeals.
26-Jun-2014	The United States federal government files its motion with the D. C. Circuit Court of Appeals to lift its stay. Until the motion is decided, the earlier law (**CAIR**) remains in effect.
23-Oct-2014	The U.S. Court of Appeals for the D.C. Circuit ordered that EPA's motion to lift the stay of the Cross-State Air Pollution Rule be granted. CSAPR Phase I implementation scheduled for 2015.
16-Nov-2015	EPA proposed the updated CSAPR rule
7-Sep-2016	Final Cross-State Air Pollution Rule Update
3-Nov-2016	EPA proposed to remove Texas from the CSAPR SO_2 and annual NO_x trading programs.
21-Sep-2017	The Cross State Air Pollution Rule applied to 26 states: Alabama, Arkansas, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia, and Wisconsin

Sources: https://www.epa.gov/csapr/cross-state-air-pollution-rule-additional-actions

[11] U.S. Supreme Court, "EPA v. EME Homer City Generation - Brief for the states and local respondents in opposition," June 2013.

confidence in the market broke down for two reasons. First, as noted, the court refused to accept the idea of exchanging allowances across states. Second, multiple revisions raised questions about the value of an allowance as a stable asset. When the CSAPR was finalized in 2012, the price of an allowance had fallen to less than $3. Today, the ARP still remains as an active rule. But the price of an allowance is less than $1[12] which means that the value of an allowance has hardly any effect on the reduction of emissions.

Interestingly, as shown in Figure 4, the policy had enduring effects despite the weakening of its main mechanism. That is, the levels of emissions continued to drop even after the perceived effectiveness of the allowance market was challenged. Considering the lack of confidence in the market and the low allowance price, there were opportunities to increase (or at



Source: EPA's Clean Air Market Data Base (2017).

Figure 4. SO_2 emissions of coal-fired power plants across U.S. (1995–2011).

[12] In the 2017 auction, the price of a 'spot' allowance, an allowance that could be used immediately, was sold at $ 0.75.

least maintain the current level of) emissions or disregard the questionable market. Based on data provided by the EPA, neither of these cases occurred. Why did coal-fired facilities maintain their efforts to reduce SO_2 emissions despite the opportunities to exploit the failures in the ARP market?

According to Schmalensee and Stavins (2013), economists have argued that the technological development of filters (scrubbers), the optimization of mixing high and low-sulfur coal for electricity generation, and the rise of natural gas as a substitute for coal are the main reasons for the decline in emissions despite the allowance market conditions. However, while economists have focused on technological developments and energy market factors that contributed to the additional drop in emissions, how local sociopolitical contexts contributed to coal-fired facilities' environmental performance has been relatively overlooked. In this dissertation, I do not attempt to reject the effect of monetary incentives or technological developments on SO_2 emissions. Rather, in the next chapter (Chapter 3) I explore how sociopolitical context at the state level compelled coal power plants to maintain their conformity with a questionable policy (ARP) at the federal level.

2.3 Sociopolitical context of the ARP

2.3.1 Formal sociopolitical environment and the ARP

When George H.W. Bush won the presidential election in 1988, he promised to revise the CAA and become "the Environmental President" in order to gain political support from voters in swing states who had been increasingly interested in environmental conservation (Chan et al., 2012; p. 27). His campaign received favorable attention from these voters because the prior

presidential administration (under President Ronald Reagan) had lacked interest in enacting regulations as a means of addressing public policy problems. While inheriting Raegan's Republican free market ideology, Bush, on the other hand, emphasized the importance of cutting acid rain pollutants[13] (Evans and Woodward, 2013). Since economic growth began to decrease in the late 1980s, the Bush administration had to find a way to devise a cost-effective policy that would not only minimize the economic impact of environmental regulations but also cut SO_2 emissions by half (Chan et al., 2012; Schmalensee and Stavins, 2013). To resolve these contradictory issues, regulating coal-fired facilities with market-based approaches was introduced by the new administration.

When a market-based policy was considered in Congress between 1989 and 1990, political debates around environmental issues were not determined by party ideology (e.g. Democratic v. Republican). Even within the same political party, policy debates were mostly driven by economic impacts on particular states (Chan et al., 2012; Schmalensee and Stavins, 2013). For example, within the Democratic Party, on the one hand, Henry Waxman of California showed full support for the CAA as his state was struggling with smog and acid rain pollutants. On the other hand, Jon Dingell of Michigan was against the CAA because his political support mostly came from the automobile industry, which had been associated with coal-intensive industries. Moreover, the Majority Leader of the Senate at that time, Robert Byrd (Democratic) had not been in favor of the CAA as he represented West Virginia, a state with high reliance on coal mining. As a consequence, the coalition was not large enough to secure votes to pass the CAA.

[13] The speech of Bush on environmental policy can be found at https://millercenter.org/the-presidency/presidential-speeches/february-9-1989-address-joint-session-congress

The political climate changed in 1988 when George Mitchell, a Democratic Senator of Maine, was elected as the Majority Leader of the Senate. He had been pressured by voters to fix air quality problems as the state of Maine was seriously affected by acid rain pollutants during this period (Chan et al., 2012). As the Majority Leader, Mitchell was motivated to negotiate with the Republicans and the Bush administration to secure enough votes to pass the CAA and as a result, the bill passed the House by a vote of 401 to 25 and passed the Senate 89 to 10.[14]

After 20 years, however, environmental issues became tightly aligned with political ideologies, reflecting partisan (Republicans vs. Democrats) separations (Shipan and Lowry, 2001). For example, in 2010 the U.S. Senate attempted to apply cap-and trade mechanisms to cut carbon dioxide (CO_2) emissions. During the debate, Republicans criticized their own invention (cap-and-trade) as an ineffective tool and argued that an allowance acted as an unnecessary tax on coal-fired facilities (Schmalensee and Stavins, 2013). The lack of political support for the "cap-and-trade" mechanism later contributed to the collapse of the SO_2 allowance market as stakeholders questioned the legitimacy of the allowance.

2.3.2 Informal sociopolitical environment

In this section, I introduce how environmental movement organizations responded to events associated with the ARP. This is an important question because while many studies explored how formal sociopolitical actors, such as government officials and the Congress, reacted to the

[14] The percent of Senators and House members voting 'yea' for the Clean Air Act Amendments;

	Senate	House
Democrats	96%	91%
Republicans	87%	87%

first market-based policy, the role and response of informal sociopolitical actors associated with the ARP have been relatively overlooked.

As previously mentioned, in the beginning most environmental movement organizations (EMOs) opposed the idea of using market mechanisms as policy instruments for several reasons. First, although environmentalists partly accepted the validity of the allowance trading program at the national level in terms of emission reductions, viewing an allowance as a license to pollute led to other concerns such as creating "hot spots" where the level of emissions is relatively higher than in other regions (Stavins, 1998; p.72). In other words, activists perceived allowances as rights to pollute rather than regulatory constraints. Others criticized the ethics behind trading allowances; they believed that quantifying and financializing issues related to human health and ecological welfare was not only impossible but also unethical (Kelman, 1981; Stavins, 1998). Lastly, EMOs objected to the cap-and-trade for political reasons. Because the level of the emissions cap would be set on a consensus between political parties, they feared that the level of emission cap would be (politically) difficult to adjust (in particular- a tightening the cap) once implemented (Stavins, 1998). In short, to EMOs, preserving the environment through a capitalistic approach was viewed as an impossible endeavor.

To incorporate the strong voice of the environmental community, the Reagan administration invited the Environmental Defense Fund (EDF), representing EMOs, to take part in designing the market-based policy. The administration hoped that the inclusion of the EDF would provide support from other environmental activists. The EDF[15] also sought this opportunity to distinguish their movement identity from that of other environmental movements

[15] EDF Executive Director Fred Krupp, Senior Economist Daniel Dudek, and Staff Attorney Joseph Goffman worked closely with the White House to develop the initial allowance trading proposal (Stavins, 1998).

by fixing environmental problems through a capitalistic approach– the market (Stavins, 1998). The cooptation strategy eventually paid off in 1983 (as shown in Figure 5) when the Reagan administration received support from 13 major EMOs in the U.S. The actual bill was signed in 1990 by Reagan's successor, George W Bush. As shown in Figure 6, EMOs were invited to the signing ceremony along with lobbyists and Democrats (*The Washington Post, 16 November. 1990*). Overall, during the 1980s, EMOs changed their position from opponents to supporters of the ARP.

13 groups ask for acid rain program

United Press International

WASHINGTON — A coalition of 13 national groups — ranging from the League of Women Voters to the Sierra Club — is calling on President Reagan to develop a tough program for controlling acid rain pollution.

The groups forming the National Clean Air Coalition made the demand in a letter Monday calling on Reagan to fulfill what they believe is a pledge to do something about highly acidic air pollution.

Reagan made the promise last spring, they argued, when he told EPA Administrator William Ruckelshaus to reassess policy on acid rain.

"In your first public statement about the mandate of the EPA under Mr. Ruckelshaus, you put acid rain at the top of the priority list," the coalition stated. "We cannot afford to wait another generation."

Other groups signing the letter include: the National Wildlife Federation, National Audubon Society, Friends of the Earth, Natural Resources Defense Council, Wilderness Society, Izaak Walton League of America, National Parks and Conservation Association, Environmental Defense Fund, Environmental Action, Environmental Policy Center and United Steelworkers of America.

The letter to Reagan came the day after Ruckelshaus admitted the revised acid rain policy is being delayed by sharp differences within the administration.

Ruckelshaus made the comment at a Sunday news conference in Halifax, Nova Scotia, where he and Secretary of State George Shultz met with Canadian officials on environmental matters.

The EPA chief cautioned he did not want to "create the anticipation of a date" for action on the matter.

That appeared to displease Canadian Environment Minister Charles Caccia, who warned, "Canadians are becoming, of course, impatient on this issue."

Ruckelshaus had hoped to present Reagan by the end of September with four alternative strategies for reducing acid rain damage to surface waters, forests and man-made structures in the northeastern United States and southeastern Canada.

An EPA spokesman said Monday the new policy plans are not indefinitely stalled within the agency and the administration.

"It's still bubbling, it has not stopped," said EPA spokesman Rusty Brashear.

But he acknowledged there is no tentative date scheduled for presentation of the pollution control plans to Reagan.

The Canadian government and environmentalists want a 50 percent reduction in sulfur dioxide emissions from coal-burning power plants and industries, largely in the Midwest United States. Scientific reports identify sulfur dioxide emissions as the major cause of acid rain.

Source: United Press International (1983)

Figure 5. News article about SMOs' asking for the ARP

A6 FRIDAY, NOVEMBER 16, 1990 THE WASHINGTON POST

Bush Signs Sweeping Air Pollution Controls Into Law

By Michael Weisskopf
Washington Post Staff Writer

Proclaiming a "new era for clean air," President Bush yesterday signed into law sweeping controls designed to sharply reduce pollution from cars and factories by early next century.

The Clean Air Act Amendments of 1990, signed at an East Room ceremony, impose new, costly technological requirements or health standards on virtually every industrial sector in hope of restoring the atmosphere's protective ozone shield and combating urban smog, acid rain and cancer-causing plant emissions.

"This legislation isn't just the centerpiece of our environmental agenda," said Bush, fulfilling a campaign pledge as he signed the bill. "It is simply the most significant air pollution legislation in our nation's history."

The legislation closes a gaping hole in the nation's environmental laws, strengthening and expanding a statute allowed to erode since its last revision 13 years ago. Air quality deteriorated in the interim, with unhealthy levels of smog spreading to 100 cities, factory fumes exposing communities to unusually high cancer risks, acid rain taking a toll on forests and streams of the Northeast and the ozone layer thinning over Antarctica and parts of Europe and North America.

The law gives the federal government new and more potent weapons to battle those threats. Antipollution controls extending from coke ovens to bakeries are expected to cost industry $25 billion a year eventually to implement and raise consumer prices of everything from new cars to dry cleaning.

But under the law's timetable, it will take years before Americans begin to breathe easier. With cutbacks in auto pollution and requirements for cleaner gasoline delayed to accommodate industry, "seriously" smoggy cities, such as Washington, are not required to achieve health standards for nine years. More polluted places, such as Baltimore and Chicago, will take 15 and 17 years, respectively, to meet standards.

"Our kids will have kids of their own before they can play outside in the summer without health warnings," said Fran DuMelle of the American Lung Association.

For communities downwind of toxic emissions, partial relief will come as early as 1995 when controls for industrial sources of 41 pollutants must be installed and capable of cutting emissions at least 70 percent. But for sources of 148 other pollutants, including carcinogens, the deadline is 2003. And years more will be permitted to curb high cancer risks remaining after the initial round of controls.

Only the least damaged streams of New England are expected to benefit from the early years of acid rain controls. The program requires utilities to cut sulfur dioxide emissions 10 million tons, then cap them. But the reductions will be phased in slowly, meeting the goal in the year 2000.

"Given the political context, this is a defensible bill," environmentalist David Hawkins said. "From a 21st century perspective, it will not look very demanding."

But for businesses grappling with the oil shortage and threat of recession, the new law is far-reaching—"it will dramatically change our lifestyles and the way most companies do business," said Bill Pay, lobbyist for an industry umbrella group.

The costs of those changes will be passed along to consumers, adding $100 to the price of new, cleaner cars in 1996; 10 cents per gallon for cleaner gasoline sold in the nine smoggiest cities; electricity rate hikes as high as 16 percent for customers of the dirtiest utilities in the Midwest, and uncertain price increases for small businesses such as bakeries and dry cleaners that emit newly regulated substances.

Fortunes of entire industries will shift under the new law. Producers of ethanol, a corn-based alcohol that reduces the oxygen content of gasoline, are headed for a boom. A 1992 requirement for higher oxygen content in fuels sold in 44 cities with the worst carbon monoxide is expected to double sales of ethanol by 1995. Acid rain controls are expected to ring up sales of $10 billion for companies that sell "scrubber" technology to take the sulfur out of power plant exhausts.

The same controls threaten the high sulfur coal industry in Appalachia and the Midwest, which is expected to lose 20 percent of its projected market in the year 2010 and lay off 5,500 miners. Low sulfur coal interests in the West will profit.

Calling it "the most significant air pollution legislation" ever, Bush signs Clean Air Act.

Yesterday's signing ceremony culminated 16 months of political struggle with a guest list reflecting the coalition that produced the law. Environmentalists sat near industry lobbyists. Longtime rivals who cooperated in the bill—Reps. John D. Dingell (D-Mich.) and Henry A. Waxman (D-Calif.)—were there, as was Senate Majority Leader George J. Mitchell (D-Maine.)

Source: Washington Post (1990)

Figure 6. News article about Bush administration accepting the Clean Air Act, 1990

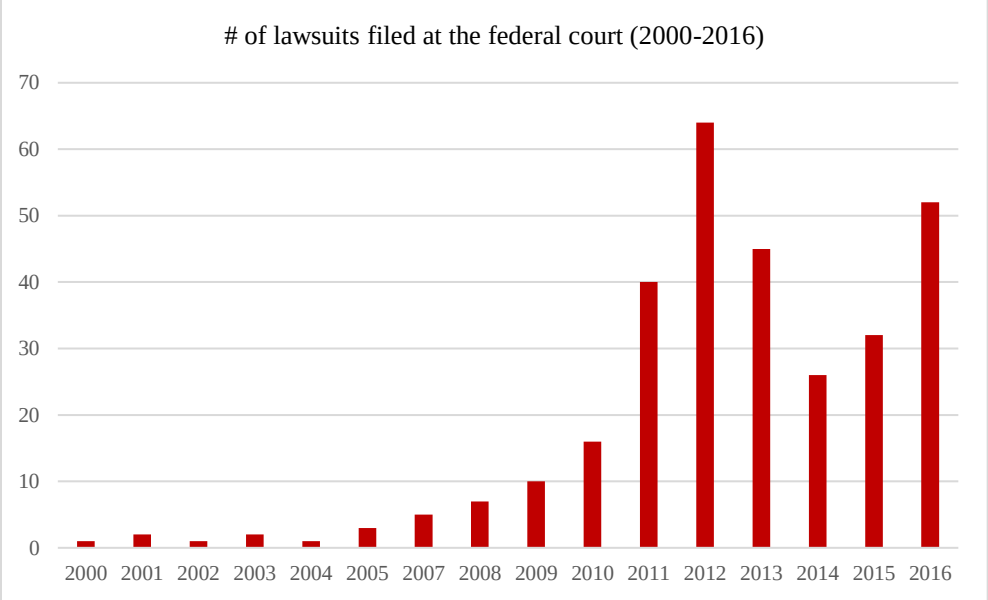
Today, most EMOs maintain their support for the ARP. For example, the Sierra Club states that it supports a national goal to reduce the level of SO_2 and other acid rain pollutants within the ARP framework.[16] Other EMOs, such as the Defenders of Wildlife, the EDF, the National Parks Conservation Association, the WildEarth Guardians, Greenpeace, and so forth,[17] allied with the Sierra Club and filed legal suits against the EPA and coal-fired facilities for not performing certain mandatory duties required by the ARP (e.g. *Sierra Club v. Gina McCarthy, 2016 and Sierra Club et al v. Portland General Electric Company, 2013*). Others such as the Acid Rain Retirement Funds maintained their investment in the allowance market as their key

[16] https://www.sierraclub.org/policy/pollution-waste-management/acid-rain

[17] This information can be found in the Bloomberg law docket search program (https://www.bloomberglaw.com).

strategy; they bought allowances to increase the price of an allowance and dumped allowances in order to decrease the emissions cap.

One thing to note is that the Sierra Club (along with its allies) attempted to maintain the effectiveness of the ARP when the policy was being challenged by stakeholders. As shown, in Figure 7, the data from Bloomberg lawsuits search program shows that between 2000 and 2009 the Sierra Club pursued 32 legal actions associated with SO_2 emissions and the ARP with its allies. However, when the validity of the ARP was being challenged by stakeholders between 2010 and 2011, the number of lawsuits filed by EMOs at the federal court increased significantly to 56, which was a 75 percent increase in two years. Between 2012 and 2016, the number of lawsuits filed soared to 241. In other words, regardless of the validity of the ARP, these EMOs sought movement opportunities within the ARP framework rather than rejecting the market-based policy.



Source: Bloomberg law docket search program (https://www.bloomberglaw.com).

Figure 7. The number of lawsuits filed at the federal court by the Sierra Club, 2000–2016

Using the context of the ARP, the next chapter explores how the influence of social movements and other formal and informal state-level sociopolitical contexts on coal-fired facilities changed when the federal regulatory environment no longer served the purpose for which it was designed. Based on the historical context of the ARP, In the analysis, I compare coal-fired facilities operating in two different time periods: when the ARP was perceived as an effective regulation by stakeholders (2003–2009) versus when the policy's perceived effectiveness was questioned by stakeholders (2010–2011). I exclude the period after the CSAPR was finalized (2012–) because the court asked the EPA to limit allowances exchange across facilities in different states. In other words, after 2012, the initial idea of transferring unlimited amount of allowances across facilities regardless of geographic boundaries ended.

CONCLUSION

The purpose of this chapter is to provide a brief history and the sociopolitical context of the ARP. As noted, the first market-based environmental policy at the federal level was established and implemented based on political calculations and pressures from the environmental community. The formal and informal sociopolitical actors both responded dynamically to changes associated with the federal law but in different directions. On the one hand, the polarization of politics led Republicans to question the validity of the policy they had once created. In this vein, according Schmalensee and Stavins (2013), the lack of political support eventually threatened the legitimacy of the ARP. On the other hand, informal sociopolitical actors who initially opposed the idea of applying market mechanisms to control emissions maintained their support for the ARP. In this dissertation, I argue that the impact of the ARP on

coal-fired facilities provides many scholarly lessons from the vantage point of institutional and social movement theories.

First, the history of the ARP allows researchers to examine how institutional effects are maintained over time. While previous studies assume that organizations would further conform to regulatory standards at the federal level when normative pressures at the local level were aligned with these standards, the ARP provides an interesting research setting to examine how legally-challenged policies maintain their regulatory effects. As noted, the major trading rules associated with the allowance market were challenged by stakeholders, leading to a collapse of the market. Nonetheless, facilities continued to reduce their emissions. Economists have pointed to the development of new technologies or lowered transportation costs as the cause of the additional drop in emissions (Schmalensee and Stavins, 2013). However, they have ignored the role of the informal sociopolitical context on facilities' polluting activities after the validity of the federal policy was challenged. In this sense, the context of the ARP allows future scholars to explore how informal sociopolitical contexts maintain the effect of questionable formal policies (Scott, 2013).

Second, to social scientists, the history of the ARP provides a rich opportunity to expand our knowledge of institutional environments. As noted, the market-based policy integrates market mechanisms with regulatory institutions. Early institutionalists distinguished the "institutional environment" from the "competitive marketplace," viewing market behavior as driven solely by efficiency concerns and competition (DiMaggio and Powell, 1983; p.147). A market-based policy like the ARP, however, renders it impossible to differentiate the two environments; it serves as a regulatory institution based on market mechanisms. In other words, the trading of allowances by market participants reflects a combination of regulatory constraint

(caps) and economic, independent (and presumably rational) decision-making. Therefore, the ARP requires a new theoretical framework to understand how markets act as socially constructed fields (Fligstein, 2001; Fligstein and Calder, 2015).

In addition, while prior studies have mainly focused on the role of SMOs as change agents or challengers that stimulate institutional change (King and Pearce, 2010), the sociopolitical background of the ARP suggests that these organizations could also serve as agents for maintaining institutional effectiveness when a regulation that favors the goals of the movement starts to break down. According to Scott (2013), sometimes formal or informal institutional elements can substitute for the roles of others to maintain institutional resilience. For institutions to persist, meaning systems and norms must be transmitted and communicated in plausible ways so that new members or challengers can accept their "fact-like" quality (Tolbert, 1988: 103). In this respect, SMOs acted as incumbents rather than challengers to maintain the norms and values of the ARP. In the next chapter, I empirically examine how formal and informal sociopolitical actors replaced the role of the federal policy in order to preserve the social order (i.e. to lower the SO_2 level).

This is in line with literature stating that institutions are maintained by interactions between formalized rules and informal common understandings. According Zucker (1986), the two institutional elements substitute for each other as the increase in one domain reduces the need for the other (Durkheim and Halls, 1984; Garfinkel, 1963; Zucker, 1986). The ARP provides a unique opportunity to test this idea by exploring how informal coercive elements, such as SMOs or citizens' political ideology, at the local level could take over the role of a questionable federal policy. In a broader context, the results imply that a broken policy at the

federal level could still maintain its effectiveness at the state level as long as the local community supports the underlying values of the federal policy.

Together, the ARP addresses another important theoretical question: How can institutional stability be achieved when institutionalized rules, norms, and beliefs are constantly challenged by the environment? If we view institutionalization as an objectified state that increases the cost of nonconformity through self-reproducing mechanisms, this question will be difficult to resolve. However, as Zucker (1988: 26) notes, maintaining an institutionalized state requires "continuous action" intended to maintain existing order. Without these efforts, "institutions would simply decay into cultural artifacts" (Dacin et al., 2010: 1395).

CHAPTER 3.

WHEN DO ORGANIZATIONS PAY MORE ATTENTION TO LOCAL SOCIAL MOVEMENTS? COAL-FIRED FACILITIES' SULFUR DIOXIDE (SO_2) EMISSIONS UNDER THE ACID RAIN PROGRAM, 2003~2011

INTRODUCTION

Management scholars have examined how social movements influence organizations to make changes aligned with social values. Recent research in this vein has examined how activists directly or indirectly stimulate organizations to adopt innovative practices and policies such as corporate social responsibility initiatives, LGBT employee practices, and proenvironmental policies (Bartley, 2003; Hoffman, 2001; King & Pearce, 2010; Raeburn, 2004; Soule, 2009). According to these studies, local social movement activists influence target organizations in a community through surveillance (constant monitoring), boycotts, protests, and so forth (King, 2008; Soule, 2009; Reid & Toffel, 2009; King & Pearce, 2010). In this process, social movement organizations (SMOs) often act as change agents that challenge current normative standards and legitimize new institutional expectations across organizational fields.

In previous studies, however, the relationship between local sociopolitical influences and upper-level (e.g. national level) institutional environments is described as a simple dichotomy between whether they reinforce each other or not. For example, scholars have found that organizations located in regions with progressive sociopolitical norms and values tend to engage more in prosocial or pro-environmental activities to meet their local demands and standards (Lee and Lounsbury, 2015; Marquis et al., 2016; Luo et al., 2017; Sine and Lee, 2009). Although these studies find the enduring influence of local institutional contexts and SMOs on targeted

organizations, they neglected to consider how institutional contexts at the national level (upper level) could concurrently shape organizational behaviors. This leads us to assume that for targeted organizations, institutional contexts serve to increase resistance to or compliance with rules and standards accepted at the federal level (Lounsbury, 2001; Marquis and Lounsbury, 2007; Greenwood et al., 2011). In other words, our knowledge of how the relationship between SMOs' activism and targeted organizations' activities at the state level is influenced by the national institutional environment (upper-level) is limited.

In this chapter, I propose that evaluating the direct influence of SMOs and other local sociopolitical contexts on organizations requires a more dynamic approach that includes consideration of institutional contexts at different levels in society. This is an important theoretical issue because our understanding of how the interaction between global (upper-level) and local (lower-level) sociopolitical contexts along with SMOs shapes organizational decisions is limited. To address this problem, I argue that the direct influence of local social movements or local sociopolitical contexts on targeted organizations may vary depending on the effectiveness of a regulation at the federal level that is associated with movement activities.

Similarly, some social movement studies also provide insights into how federal regulations might affect the influence of local sociopolitical actors, such as local governments, social movement organizations (SMO), and elites, on organizations located within the region. In particular, the political mediation model proposes that movements are more influential in some institutional contexts than in others (Briscoe and Gupta, 2016; King, 2008), and, specifically, that a local movement's mobilization and opportunity structures depend on having a favorable sociopolitical climate (Amenta, Carruthers, and Zylan, 1992; Amenta, Dunleavy, and Bernstein, 1994; Amenta and Young, 1999; Cress and Snow, 2000; Soule and Olzak, 2004; King, 2008).

According to these scholars, the direct influence of SMOs on target organizations is more likely to diminish when a regulation supporting these activists is enacted, as stakeholders and community members tend to focus more on policy implementation and to perceive legal enactment as the end of a social movement's life cycle (McAdam and Su, 2002; Cornwall et al., 2007; Olzak and Soule, 2009). In other words, federal level laws may change the influence of local sociopolitical actors on organizations by shifting their attention to the implementation of the federal policy.

Building on these perspectives, in the current paper I demonstrate that when actors believed in the efficacy of federal legislation, state-level (local) sociopolitical influences—such as social movements or citizens' political ideology—may lose their impact on target organizations. This is because the validity of a federal law directs key stakeholders' attention toward the implementation of the formalized rules, reducing the opportunity for further movement mobilization (Olzak and Soule, 2009; Amenta et al., 2010; Ostrom, 2015). From a political mediation standpoint, this means that the critical condition for SMOs to pressure their target groups— the attention of local citizens and governments on movement activities (the political mediation link at the local level) — is weakened by the effectiveness of the federal policy.

Moreover, although the purpose of federal regulation is to control target organizations' activities, compliance provides a signal of "good faith" efforts to address problems (Meyer and Rowan, 1977; Tolbert and Zucker, 1996). Therefore, when local stakeholders accept a federal regulation as valid, the need for organizations to attend to local norms and culture associated with the law is reduced. In contrast, when these stakeholders no longer perceive the federal regulation as being effective, targeted organizations are likely to become more responsive to

local (state-level) normative and cultural pressures to signal their "good faith" as local stakeholders seek target organizations' sociopolitical legitimacy from local sociopolitical initiatives.

Using the data on coal-fired facilities' sulfur dioxide (SO_2) emissions under the Acid Rain Program (ARP) between 2003 and 2011, my results show that state-level SMOs had a greater impact on coal-fired facilities' emissions of SO_2 when the validity of the federal law (ARP) was brought into question by stakeholders. When the ARP was accepted as a proper regulatory framework (2003–2009), state governments, elites, citizens, and even movement activists focused on the implementation of the federal policy. By conforming to the federal policy, coal-fired facilities were able to avoid independent pressure from state-level sociopolitical actors to reduce acid rain pollutants. As stakeholders' attention towards the federal policy increased, coal-fired plants became less attentive to state-level norms and values associated with SO_2 emissions.

However, when the policy's legitimacy was threatened (2010–2011), the direct impact of SMOs and other sociopolitical contexts at the state level on facilities' emissions increased. During this period, the perceived effectiveness of the ARP was challenged by stakeholders, as the price of an allowance became significantly lower than the price of other means of pollution control (e.g., operating filters). The controversy over the effectiveness of market mechanisms associated with the ARP shifted the attention of local governments and citizens from policy implementation at the federal level to state-level environmental initiatives. As a result, coal-fired plants became more responsive to state-level pro-environmental contexts because the operational certainty expected from policy compliance disappeared.

The current study has several theoretical and practical implications. First, I extend the political mediation model by differentiating the role of federal and local sociopolitical contexts when discussing the effectiveness of SMOs. From this perspective, my results test the political mediation theory by showing how an accepted federal policy dampens the direct influence of SMOs at the state level. However, when state-level governments, activists, and citizens no longer trust the effectiveness of the law, the direct influence of state-level SMOs on local organizations rises again. This insight contributes to organizational research by showing that the association between federal regulation and local sociopolitical contexts is not necessarily additive but is substitutive, and that evaluating the direct influence of local sociopolitical pressures on organizations thus requires a more dynamic approach that considers institutional contexts at different societal levels.

In addition, the study contributes to the non-market strategy literature (Hiatt and Park, 2013; Carlos and Lewis, 2017; Durand and Georgallis, 2017; Hiatt, Carlos, and Sine, 2018) by demonstrating that organizations pay differential attention to local and societal-level sociopolitical factors depending on the relative legitimacy of these factors. Understanding how this interplay between local and societal-level factors affects organizations is important for both theoretical and practical reasons. Theoretically, it speaks to recent research that conceptualizes institutions as "temporary truces" (Meyer & Höllerer, 2010: 1251). The study also answers recent calls in the literature for a better understanding of how organizations respond when the "temporary truce" falters (Meyer and Hammerschmid, 2006; Raynard and Greenwood, 2014; Nicolini et al., 2016), in other words, to the deinstitutionalization of previously taken-for-granted social practices. Specifically, it shows that when an issue previously settled at the societal level

reemerges as a contested subject, organizations respond by attending to their most proximal (i.e., local) sociopolitical environment.

Practically, this insight has important strategic implications for organizations. For example, it suggests that organizations with operations in multiple locations need to change how they address the once-again contested issue. My theory and empirical findings suggest that when an issue has been settled at the societal level, these organizations can implement a generalist non-market strategy. That is, they can implement the same compliance strategy in all of their locations. When contestation at the societal level reemerges, these organizations need to adopt more of a niche (i.e., location-specific) strategy as local stakeholders' attention increases.

THEORY DEVELOPMENT AND HYPOTHESES

The Political Mediation Approach: When Do SMOs Matter?

Similar to state government organizations, local social movement activists can act as informal coercive actors that pressure targeted organizations to adhere to the local value system (Lounsbury et al., 2003; Hiatt et al., 2009; Sine and Lee, 2009; Lee and Lounsbury, 2015). For example, Lounsbury (2001) showed that universities with student groups connected to strong environmental movement activism were more likely to hire full-time recycling managers who adopted pro-environmental practices. Lee and Lounsbury (2015) found that facilities operating in states with strong environmental movement organizations, such as the Sierra Club, were more likely to improve their environmental performance by reducing the release of toxic chemicals. SMOs use tactics such as protests, constant monitoring, and legal actions to pressure targeted groups to meet their standards (Tilly, 2004; Campbell, 2007). Moreover, they often mobilize local media campaigns and collaborate with other SMOs to bring public attention to firms that do not meet their standards (Keck and Sikkink, 1998; King, 2008).

The political mediation model explains the influence of SMOs in politics. While most social movement studies have focused on the consequences of movement activities (e.g., policy adoption or institutional change), political mediation theory aims to explore the conditions under which SMOs have significant influence in achieving their goals. In this view, the strength of movements (i.e., their capacity to mobilize resources through their opportunity structure in the political system) is a necessary but insufficient condition for the attainment of movement goals (Amenta et al., 1994; Amenta et al., 2010). That is, SMOs' efforts to initiate change require a favorable sociopolitical context, which is composed of support from state agencies, elites, and citizens who can directly influence policy outcomes (Soule and Olzak, 2004; Amenta et al., 2010).

Without a supportive political climate, SMOs often receive less attention or even negative attention from other actors, which hinders resource mobilization (Dixon, 2008; Amenta et al., 2010). According to scholars (Burstein and Linton, 2002; Soule and Olzak, 2004), political ideology is often measured as an indicator of SMOs' favorable sociopolitical climate because it provides "incentives for people to undertake collective action by affecting their expectations for success or failure" (Tarrow, 1994: 85). For example, in their study of anti-chain-store laws in the United States, Ingram and Rao (2004) suggested that activists were likely to achieve their goals in a favorable political context because they encountered less countermovement activity. Others found that the level of democratization prevalent in a region influences the capacity of SMOs to mobilize resources and achieve their goals (Tilly, 2004). Their results imply that for a movement to be influential, the interest of formal institutional actors (e.g., elected officials or state bureaucrats) and the support from citizens in the region should be aligned with SMOs' goals (Kane, 2003; Amenta et al., 2010).

When a federal regulation is taken for granted by stakeholders (as was the ARP during the period 2003–2009), the direct influence of activists on target organizations is more likely to diminish because local government officials and citizens focus on the implementation of the federal law. This in turn makes it harder for SMOs to mobilize resources from citizens and to take advantage of opportunities arising from the local political environment. For instance, Olzak and Soule (2009) found that while protests conducted by environmental movement organizations had a significant impact on environmental policies at the agenda-setting stage, these activities no longer had direct effects at later stages, as political actors shifted their attention to the implementation of the law. Others found that the influence of SMOs is likely to be weakened when a policy (that addresses the concerns of SMOs) is enacted as stakeholders and community members perceive legal enactment as the end of a social movement's life cycle and show less support for SMOs' activities (McAdam and Su, 2002; Cornwall et al., 2007; Olzak and Soule, 2009). Therefore, if political mediation theory holds more generally, then the direct influence of local SMOs on organizations may weaken as the taken-for-grantedness of the federal law shifts key stakeholders' attention from the cause of a problem to the issue of implementing the regulation (Amenta et al., 2010).

Moreover, when a federal regulation is legitimate, local SMOs influence their target organizations through the law. For instance, during my study period, SMOs challenged the EPA through legal actions to force it to include dirtier regions in the CAIR to further pressure facilities operating in those regions (*Sierra Club v. EPA*, No. 04-1243, 38 ELR 20215, D.C. Cir. Aug. 19, 2008). The Sierra Club has also collaborated with other local environmentalists to investigate fraudulent calculations that may have been involved in the self-reporting process

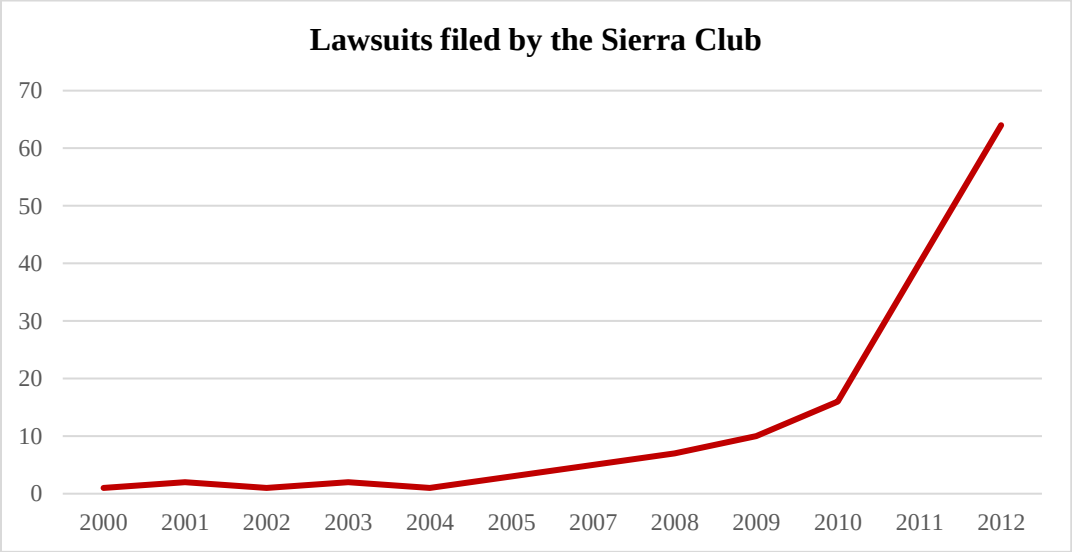
associated with toxic gases.[18] Other pro-environmental actors, such as the Acid Rain Retirement Funds, participated in the allowance market by consistently buying and hoarding allowances to reduce their total supply at the national level. That is, when the effectiveness of the ARP was trusted by stakeholders, SMOs concentrated on the implementation of the federal law, and thus the effect of SMOs on target polluters was replaced by the federal law.

In addition, corporations, which are often targeted by local sociopolitical actors, also shift their attention to the federal law. Even though the purpose of a federal regulation is to control target organizations' activities, it also provides a legitimate tool to stably operate within legal boundaries regardless of geographic location. For example, in the case of the ARP, coal-fired facilities obtained allowances from either the EPA or the market. In theory, an allowance represented the protected right at the federal level to emit one ton of SO_2. This meant that emitting one ton of emission with an allowance was accepted by local stakeholders and sociopolitical actors. Given that local sociopolitical actors accepted the legitimacy of an allowance when the federal policy was taken for granted, it is likely that target organizations such as coal-fired facilities would focus their attention on the federal law, but pay less attention to local sociopolitical actors including SMOs.

However, when formal regulatory actors (e.g. government officials) began to question the legitimacy of the federal regulation (2010–2011), I propose that the direct impact of informal regulatory actors such as SMOs on coal-fired facilities increased because activists tried to make firms comply with the law, which had lost its credibility as a means of controlling SO_2 emissions. As noted in the previous chapter, when the ARP was being challenged (2010-2011),

[18] Jacobs, 2009, "An air of deceit" from the *Pasadena Weekly* (https://www.pasadenaweekly.com/2009/08/20/an-air-of-deceit).

SMOs (e.g. Sierra Club, Environmental Defense Fund, Greenpeace, Defenders of Wild Life, National Parks Conservation Association, etc.)[19] teamed up to pursue legal actions on SO_2 producing corporations and electric utilities that violated provisions associated with the ARP. As shown in Figure 8, the federal court data demonstrates that between 2003 and 2009, the Sierra Club pursued 28 legal actions associated with ARP and SO_2 emissions. When the validity of the ARP was questioned by stakeholders (between 2010 and 2011), the number of lawsuits filed in federal court increased about 50 percent[20]. During this period, other activists, such as the Acid Rain Retirement Fund, maintained their movement strategy (purchasing allowances and then taking them off the market) despite the questionable value of an allowance. These examples present SMOs' effort to maintain the effectiveness of the ARP during the period when market mechanisms were challenged.



Source**: Bloomberg law docket search program (https://www.bloomberglaw.com)**

Figure 8. The count of lawsuits filed by Sierra Club involving SO_2 emissions between 2000-2012

[19] This information can be found in the Bloomberg law docket search program (https://www.bloomberglaw.com).

[20] The Sierra Club along with other environmental movement organizations filed 64 lawsuits in 2012.

Furthermore, when environmental regulations supported by activists are challenged, SMOs could threaten their target organizations by attempting to reshape the current sociopolitical landscape with new agendas. To expand the scope of issues covered by the environmental movement, activists look for other relevant SMOs based on cultural similarities or other like attributes (Jung et al., 2014). During the study period, for example, some SMOs (the Sierra Club and the Natural Resources Defense Council) linked their activities to the American Lung Association to incorporate public health concerns associated with detrimental small particles in an attempt to further reduce SO_2 emissions. The Sierra Club then launched its "Beyond Coal Campaign" in 2010, pressuring local governments to adopt tougher environmental rules and to shut down local coal-fired facilities based on additional concerns associated with acid rain pollutants.

In sum, I argue that the influence of local SMOs on target organizations is likely to increase when the perceived effectiveness of federal policy that was once supported by the movement is challenged. First, when the efficacy of a given national law is challenged, SMOs act as informal coercive actors to maintain target organizations' compliance with a questionable regulation supported by activists. Second, the questionable policy at the federal level lead local SMOs to shift attention from federal policy implementation to local environmental initiatives. I therefore hypothesize that

H1. The influence of local social movement organizations on coal-fired facilities' environmental performance will increase when the legitimacy of the ARP is challenged by stakeholders.

The Influence of State-Level Sociopolitical Contexts on Target Organizations

In addition to local SMOs, I also examine whether the sociopolitical climate at the state level, a critical condition for local SMOs' success, shifted in favor of SMOs, particularly those targeting SO_2 emissions when the federal policy was challenged. As previously mentioned, between 2010 and 2011, key stakeholders questioned the value of an allowance as a means for protecting the rights to produce SO_2. Furthermore, the EPA's failures to amend the policy created operational uncertainties for coal-fired facilities. Drawing from an institutional perspective, here, I argue that when the effectiveness of the ARP was questioned, the influence of local sociopolitical contexts on coal-fired facilities' emissions increased as facilities could no longer secure operational stability from the federal policy. In particular, I explain why coal-fired facilities attended to their informal (normative and cultural-cognitive) and formal (regulatory) sociopolitical contexts at the state-level which are closely associated with SMOs' effectiveness (Soule and Olzak, 2004; Sine and Lee, 2009).

Zucker's (1986) work on institutional-based trust provides some insights into the relationship between federal rules and state-level sociopolitical contexts. According to Zucker, the level of trust among community members is based on shared norms and values within a community. In her study, she defined trust as a set of expected outcomes during transactions shared by all entities engaged in exchange activities of various kinds. Using the historical context of financial institutions between the 19th and 20th centuries, she then introduced how the trust-formation process shifted from locally-based informal norms and values within a community to institutional-based trust, where trust is constructed beyond geographical boundaries through formal societal structures, such as rules, codified practices, and bureaucratic agencies. From this

perspective, she explained that the establishment of formal societal structures (e.g., the enactment of a federal regulation) created a common understanding among stakeholders about a given situation by rationalizing cultural and normative elements across regions.

From an environmental standpoint, state-level norms and values provide a general moral standard about preserving the natural environment, such as "air pollution should be reduced, as it harms our environment." Studies in this vein have shown that the level of such standards varies across regions because people's expectations are largely dependent on regional cultural values (Kamieniecki and Kraft, 2013; Lee and Lounsbury, 2015). On the other hand, federal rules and regulations provide a specific standard, such as "coal-fired facilities that pollute SO_2 above their cap will be fined $2,000 per ton," regardless of location. Therefore, when a given rule is taken for granted and trusted, stakeholders operating under the formalized rule are likely to expect similar modes of polluting behavior from the local facilities across regions. This example shows that when the rule-setting process is complete, diverse cultural and normative elements across communities are "forced into a uniform pattern" (Zucker, 1986: 99).

Particularly in a democratic society, the legislative process entails several stages at which formal and informal sociopolitical actors participate and negotiate depending on their interests and normative expectations (Shugart et al., 2005). When a consensus is reached among stakeholders, the institutionalization process of a given policy creates a sense of trust and becomes a mutual governance structure accepted by local stakeholders and organizations across regions (Zucker, 1986). For example, in her study of the U.S. banking industry, Zucker (1986) found that, over time, traditional market transaction norms built on reputation and kinship were replaced by formalized mechanisms (e.g., rules and regulations) when these rules and regulations were able to ensure stakeholders' transactions both within and across geographic boundaries. For

organizations, the rationalization of norms decreases operational ambiguities because rules built on mutual expectations and trust among stakeholders define the boundaries of legitimate behavior and reduce the chance of misinterpreting local normative demands. As a result, institutional-based trust reduces the need for organizations to attend to norms and values associated with the situations covered by the law.

To examine whether the influence of norms and values at the local (state) level on coal-fired facilities was affected by trust in the efficacy of the ARP, I first examine citizens' political ideology. Previous studies defined ideology as a shared mental framework that helps interpret the social world and identify good and proper ways of addressing social problems (Denzau and North 1994; Erikson and Tedin, 2003). Ideology is "a set of beliefs that are used to justify or challenge a given sociopolitical order and are used to interpret the political world" (Zald, 1996: 262). From an institutional theory perspective, this definition is in line with normative and cognitive institutional elements, as political ideologies not only reflect a logic of appropriateness but also are difficult to change once established (Scott, 2013).

With regard to environmental issues, Uyeki and Holland (2000) found that party identification was significantly associated with their measure of pro-environmental attitudes, with Democrats being more environmentally friendly. According to Feinberg and Willer (2013), Americans' attitudes toward pro-environmental policy became highly polarized as pro-environmental discourses became largely associated with moral values shared by liberals. Regions dominated by a politically conservative party (Republicans) emphasized economic growth and respect for authority, which often compete with environmental or ecological ends (DesJardins, 1998). Along these lines, recent studies found that organizations operating under Democratic local governments are more likely to invest in improving environmental

performance because liberals are more likely than conservatives to support the idea of environmental protection (Kamieniecki and Kraft, 2013; Dietz et al., 2015; Lee and Lounsbury, 2015; Rich, 2016). These studies suggest that politically liberal regions are more likely to embrace pro-environmental norms and values.

Unlike the influence of SMOs' activities, there is no evidence that state-citizens became more politically liberal after the collapse of cap-and-trade mechanisms at the federal level. According to Brown (1988), political ideology at the state level does not change significantly even over time because people are often socialized to the dominant political ideology within the region. He noted that the stability remained despite the increase in immigration levels in the U.S. Similarly, using a 37-years of longitudinal data,[21] Sears and Funk (1999) found that respondents experienced a crystallization process, which infused predispositions that strengthened initial political ideology over time. The stability of state political ideology was later empirically supported by Brace and his colleagues (2004) who used various state-level indicators. Considering the stability of political ideology at the state-level, it is highly unlikely that the failure of market mechanisms associated with the federal policy shifted citizens' ideological stance at the state level.

However, Zucker's (1986) findings lead us to expect that when the legitimacy of a given national policy is challenged, the influence of state-level norms and values on organizations will become more important to target organizations. When the uniform pattern accepted by key stakeholders at the federal level is questioned, local actors would begin to look for a logic of appropriateness at the local level because a "stable set of [common] expectations" established at

[21] The authors used Terman longitudinal study, which followed 1,272 respondents' political ideology between 1940 and 1977.

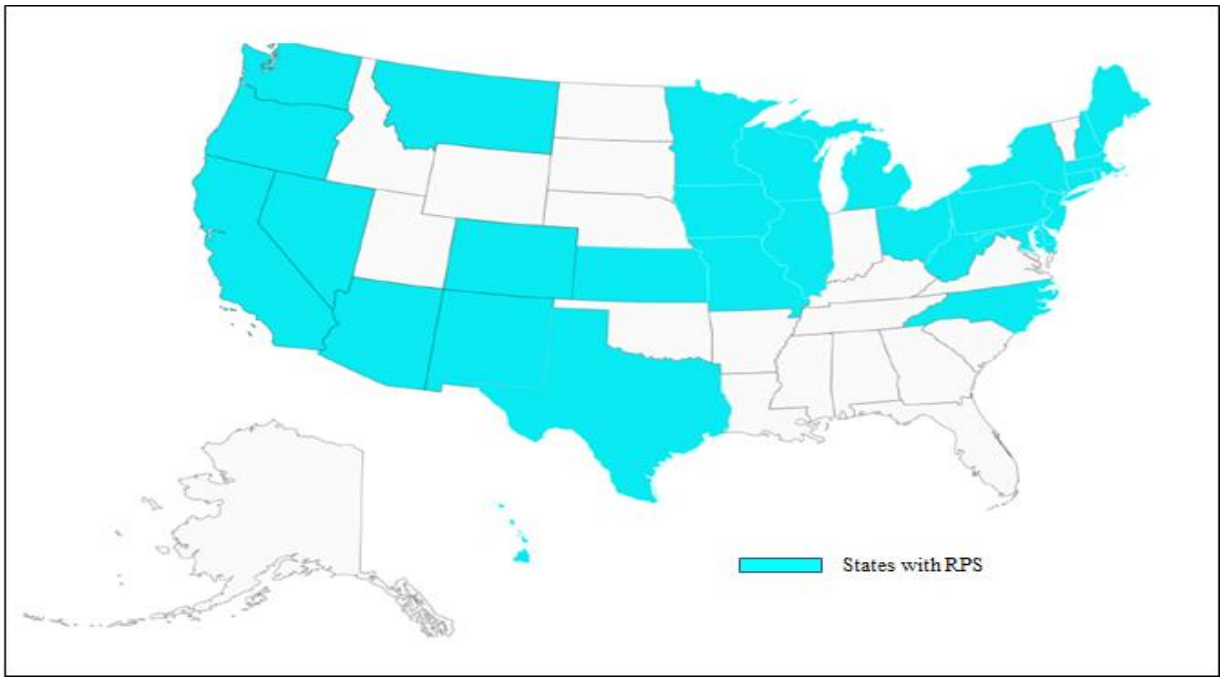
the federal level no longer exists (Zucker, 1986: 100). For this reason, I argue that when target organizations such as coal-fired facilities comply with the federal law, they will be less concerned about state-level influences on their activities as local stakeholders and sociopolitical actors accept the efficacy of a federal policy in addressing a social concern.

Nonetheless, as the CAIR succumbed to legal challenges, decreasing the consensus around the ARP, it is more likely that organizations would pay attention to local- (state-) level sociopolitical norms and values associated with the ARP to secure their legitimacy and, hence, operational stability (Campbell, 2007). Therefore, I argue that facilities operating in politically liberal states were more likely to reduce SO_2 emissions when the effectiveness of the ARP's market mechanism was challenged compared to those in conservative states.

H2. The influence of local citizens' political ideology on coal-fired facilities' environmental performance will increase when the legitimacy of the ARP is challenged by stakeholders.

Moreover, when the validity of the ARP was challenged, local environmental regulations would be used to replace the influence of the federal policy as local stakeholders' attention shifted from the federal policy to local environmental initiatives. Therefore, plants' operational constraints from local environmental regulations would increase as the effect of federal law decreased. As shown in Figure 9, apart from the ARP, some state governments also adopted Renewable Portfolio Standard (RPS) to suppress additional toxic gas emissions—including SO_2—by limiting the demand for electricity from fossil fuels. These states reduced electricity generation from fossil-fuel plants by mandating that a certain percentage of energy generated or distributed by a utility company must come from renewable sources. Otherwise, the company

would face a monetary penalty. In this vein, environmental scientists have suggested that the adoption of an RPS would be an effective state-level policy for reducing emissions of SO_2 as well as nitrogen dioxide, carbon dioxide, and mercury (Dobesova, Apt, and Lave, 2005; Mai et al., 2017). In terms of implementation, states with RPSs delegated the oversight of this policy to their Public Utilities Commissions (PUCs), which were in charge of implementing the law: writing detailed rules, monitoring utilities, and punishing those that violated the law. In this respect, at the state level, the RPS was used not only to promote the use of renewable energy but also to control various pollutants produced from coal-fired facilities at the state level including the emissions of acid rain pollutants.



Source: **National Conference of State Legislatures (http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx)**

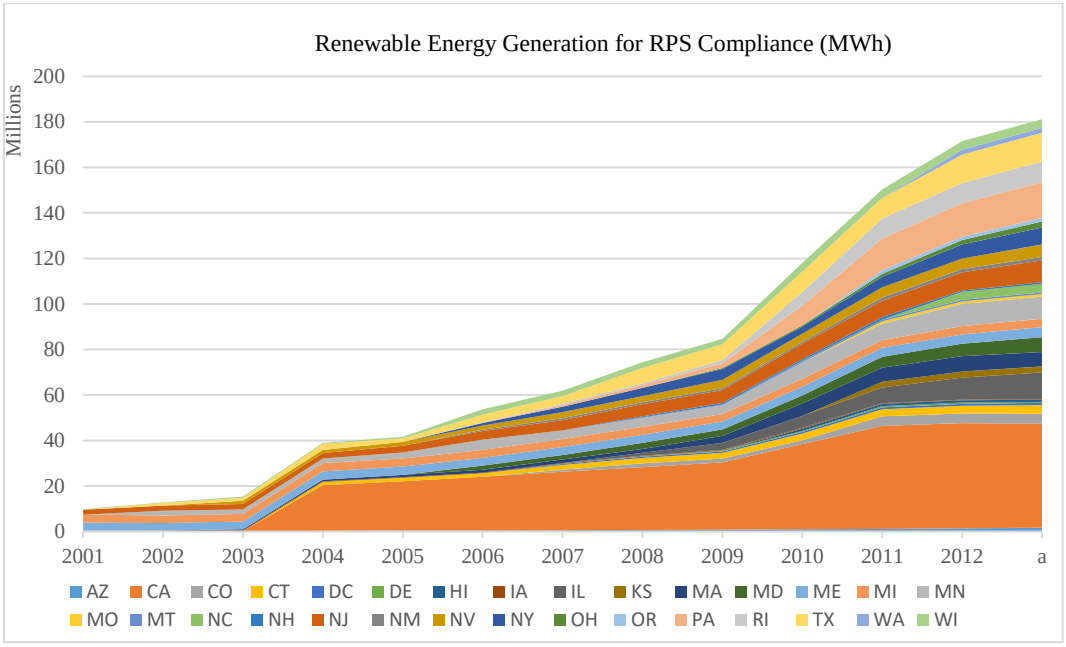
Figure 9. States with Renewable Portfolio Standards (RPS), 2011

During the time the ARP was perceived as an effective regulatory mechanism (2003–2009), an allowance represented the protected right at the federal level to emit one ton of SO_2.

Since coal-fired facilities' SO_2 emissions were justified by allowances obtained from either the EPA or the market, operational activities related to SO_2 emissions were mostly affected by the federal policy rather than local environmental regulations. As a result, the need for coal-fired facilities to attend to local regulatory standards associated with SO_2 was reduced when local stakeholders accepted the validity of the federal regulation. In fact, some studies examining the implementation of state-level RPS argued that this was largely a symbolic and toothless policy during this period (Vasseur, 2014; Cordero and Sine, 2017).

However, when the ARP faced challenges (2010–2011), I argue that coal-fired facilities would begin to attend more closely to state-level regulations as local stakeholders' attention shifted from the federal policy to local environmental initiatives. This is because local environmental regulations would start to cover local facilities' SO_2 emissions and uphold the goals of the questionable policy. As shown in Figure 10, state governments started to implement higher renewable energy standards during this period. Although the initial adoption of the RPS was to promote the use of renewable energy rather than to diminish acid rain pollutants, these states advertised the effectiveness of state-level renewable policies with respect to reduction in SO_2 emissions when the ARP was being challenged. For example, States, such as Illinois, celebrated their success in reducing SO_2 by implementing the RPS (Progress Illinois, 2013). Similarly, the state of Oregon announced that the State would adopt the RPS in 2007 to reduce the states' dependency on coal for cutting toxic materials. In 2016, the state set a new goal to generate at least 50 percent of its energy from renewable sources by 2040 in order to decrease emissions of greenhouse gases and acid rain pollutants[22]. In this vein, the National Renewable Energy Laboratory and the Berkeley Lab reported that the application of state-level RPSs

reduced 77,400 tons of SO_2 emissions in 2013 at the federal level to promote the effectiveness of the RPS (Wiser et al., 2016).



Source: National Conference of State Legislatures, 2000-2012

Figure 10. Renewable Energy Generation for RPS Compliance

Moreover, key stakeholders reduced their dependency on the crippled federal policy and attempted to seek local environmental initiatives. For example, in 2011 Washington governor Chris Gregoire signed legislation to phase out energy production from coal by mandating that local coal-fired facilities install additional air pollution control technology (Environmental News Service, 2011[23]). In a similar vein, in 2014 the Indiana Department of Environmental Management confirmed that it would implement more stringent rules at the state level to lower the level of SO_2 emissions (Indiana Department of Environmental Management, 2014). In other

[23] In 2016, the state of Oregon passed the Clean Electricity and Coal Transition Plan (SB 1547-B)" http://envirolaws.org/bill-file/the-clean-electricity-and-coal- transition-plan

words, these states took advantage of local environmental regulations to control SO_2 and other acid rain pollutants.

Together, these examples show how states with pro-environmental initiatives not only maintained but increased their bid to reduce SO_2 emissions even when the federal ARP was being challenged (Vasseur, 2014; Dietz et al., 2015). From this perspective, I argue that when an environmental policy at the federal level is perceived as effective, firms will focus on their compliance strategies associated with the federal law. However, when the validity of the federal law is being challenged, I hypothesize

> *H3. The influence of state-level pro-environmental regulations (e.g., RPS) on coal-fired facilities' environmental performance will increase when the legitimacy of the ARP is challenged by stakeholders.*

CHAPTER 4.

METHODOLOGY AND DATA

4.1 Data

To test my hypotheses, I gathered data from the clean air market database[24] (CAMD), which provides various types of operational information at both the facility (plant) and the unit (chimney) level. A facility consists of one or more units that generate acid rain pollutants. Since units are mostly operated, controlled, and monitored at the facility level, my unit of analysis in this study is the facility. Moreover, the EPA requested electricity generating units for compliance at the facility level to provide more operational flexibility and collected the allowance information at the facility level (EPA 40 CFR Parts 51, et al., 2004).[25] Assuming that each unit had certain rights over the allocation of allowances and other operational decisions at the facility level, I argue that analyzing at the facility level meets my research objectives.

For greater simplicity in the analysis, I limited my sample to plants that generated more than 50 percent of their electricity from burning coal. The study period is from 2003 to 2011 because the EPA not only recorded ownership data but also introduced a nitrogen dioxide control regulation under the ARP beginning in 2003. I end my analysis in 2011, when the Obama administration finalized a new rule (the Cross-State Air Pollution Rule; CSAPR) to replace the CAIR. Under the new rule, the EPA considered seasonal variations and additional pollutants. Although CSAPR was vacated in 2012,[26] I end my analysis with 2011 because the announcement signaled potential changes to coal-fired facilities and market participants. In the United States, all facilities under the ARP had to measure and report their emissions to the EPA

[24] The data can be obtained from the EPA website (http://ampd.epa.gov/ampd).

[25] 40 CFR Parts 51, et al. Supplemental Proposal for the Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Clean Air Interstate Rule); Proposed Rule, Environmental Protection Agency (2004).

[26] The CSAPR was challenged in court by 27 states; and in August 2012, the D.C. Circuit invalidated the rule.

by using either a continuous emission monitoring system (CEMS) or other approved methods. Over this period, the data cover coal-fired facilities' basic information, SO_2 emissions, SO_2 allowances trading information, program compliance, auction results, and so forth. Based on this information, the EPA allows researchers to collect data from the unit level up to the state level.

In addition to using the CAMD, I collected data from sources such as the U.S. Energy Department, the Bureau of Labor Statistics (BLS), the Database of State Incentives for Renewable Energy (DSIRE), and the Sierra Club. I then integrated these data into a unique dataset that allows us to examine how state-level characteristics affected coal-fired facilities' environmental performance. Overall, there are 3,604 observations across 43 states during my study period. Some states, such as Alaska, California, Hawaii, Maine, Rhode Island, Idaho, and Vermont, as well as the District of Columbia, were omitted from the sample because they have no facilities that primarily generate electricity from coal. These exclusions should not affect my analyses, as these states are either strongly pro-environmental (e.g., California and Vermont) or relatively small in terms of energy consumption and population compared with average states (e.g., District of Columbia and Alaska). The combined datasets provide a rich context for testing my hypotheses on how societal-level and regional factors influence organizations in a more dynamic way.

4.2 Variables

Dependent Variables

To construct a measure of environmental performance across facilities, I used the total amount of SO_2 (in tons) emitted annually by each facility divided by its total number of units, "chimneys" (ton/unit). Previous studies used other measures such as emission tons per heat input (BTU), or

emissions per unit of electricity generated (MWh), to capture the emissions of units ("chimneys") within a facility (Ellerman and Montero, 2007; AlRafea et al., 2016). However, these studies assumed that each unit was independent enough to determine its own operational decisions. In reality, operational decisions, such as the use of allowances, were made at the facility level based on contracts between unit owners, because during the study period, the EPA monitored the use of allowances at the facility level not only to minimize monitoring costs but also to give facilities operational flexibility (EPA 40 CFR Parts 51, et al., 2004). As a result, large facilities with multiple units optimized their use of allowances by generating electricity from certain units with high efficiency while minimizing the use of inefficient units and using the allowances from the latter to operate the former (Burtraw et al., 2005). Since facilities with more units had more operational choices for handling SO_2 emissions (Ellerman, 2000; Burtraw et al., 2005), in this paper I used emission tons per unit to compare emissions across facilities (Zhao et al., 2008; Jaber et al., 2013; Zhang et al., 2017).

After adjusting for the effect of other operational variables such as operating time, heat inputs, reserved allowances, and prior level of emissions at the plant level, my dependent variable provides an objective measure of a facility's environmental performance. My measure is consistent with that used by previous studies. For example, Lee and Lounsbury (2015) measured the total amount of chemical waste generated by each facility under the TRI as a proxy for organizations' attempt to improve their environmental performance. The reduction in emissions directly captures how facilities explicitly responded to the ARP and local (state) sociopolitical contextual factors.

Independent Variables

To test my hypotheses, I used lagged explanatory variables (t-1) in an effort to eliminate the correlation between the independent variables and the error term (Baccini and Urpelainen, 2014; Lehoucq and Perez-Linan, 2014; Steinberg and Malhotra, 2014). From an organizational study perspective, this approach is based on the assumption that an organization's response to the regional context would not be immediate but gradual due to its structural inertia (Hannan and Freeman, 1984).

First, I used Sierra Club membership (in thousands) as a proxy for the effect of state-level SMOs on facilities' environmental performance. I obtained membership data at the state level from the Sierra Club. Here, I argue that state-level membership represents local normative expectations related to environmental issues because the Sierra Club is one of the three largest environmental movement organizations in the United States (McCloskey, 1992). According to Sine and Lee (2009: 139), membership "reflects the size and strength of the Sierra Club more accurately than other measures such as the number of Sierra Club chapters in a state" and is also highly correlated with the number of SMOs in a given state.

I captured local citizens' liberal political ideology using a measure developed by Berry and his colleagues (1998, 2010). The authors constructed citizens' political ideology in two steps. First, they created an ADA/COPE measure as a proxy for the political ideology of a given state government, based on a survey by interest groups (Americans for Democratic Action and Committee on Political Education). Using the ADA/COPE score as a baseline measure, they weighted citizens' political ideology by citizens' voting behavior and by roll-call votes by members of Congress. According to the authors, the measure is strongly correlated with

Stimson's (1991, 2004) measure of political mood in a given state (Berry et al., 2010). The variable is continuous (0–100). The higher the score, the more politically liberal a given state's citizens are.

As a robustness test, I also used a variable from the League of Conservation Voters (LCV), which tracks the voting records of all members of Congress with respect to environmental legislation. The LCV score is the nationally accepted measure for rating members of Congress on environmental, public health, and energy issues (Shipan and Lowry, 2001; Dunlap and McCright 2008). Moreover, assuming that local politicians reflect local political demands, studies of citizens' political ideology use lawmakers' voting behavior as a valid measure (Berry et al, 1998, 2010; Nelson, 2002). Each year the league's committee members consisting of 20 respected environmental and conservation organizations, select the most important votes on environmental issues and calculate whether each state's Senate and House members took a pro-environmental position or not by dividing the number of pro-environment votes cast by the total number of votes scored. The LCV scores range from 0 to 200, with 0 indicating no support for the environment and 200 indicating full support from Congress members in a given state (both House and Senate members). Assuming that LCV scores reflect another aspect of political ideology associated with pro-environmentalism at the state level, I also examined whether facilities operating in states where lawmakers politically engage in issues related to pro-environmentalism faced stronger local pressures to reduce emissions when the federal policy was challenged.

Finally, to test my third hypothesis, I used a binary variable coded 1 if a given state implemented the RPS as a mandatory requirement. This information was obtained from the Lawrence Berkeley National Laboratory. I used the first year the RPS was implemented rather

than the year the law was passed to capture the actual influence of state-level regulations. As noted, state governments took advantage of the RPS to suppress coal-fired facilities' operations through legal sanctions and price competition with renewable sources (Lyon and Yin, 2010; Vasseur, 2014). After the implementation, the variable is coded 1 to indicate whether facilities operating in states with the RPS encountered formal sociopolitical pressures at the state level to reduce emissions. States that had implemented the RPS before 2003 (e.g., Iowa, Arizona, Wisconsin) were coded as 1 throughout the entire study period. As of 2011, 29 states and the District of Columbia had adopted the RPS (shown in Figure 9). This variable indicates how facilities' responses to state-level environmental regulations such as the RPS changed when the perceived effectiveness of the ARP was challenged (2010–2011).

Control Variables

As noted from my hypotheses, this study requires a multilevel approach. I controlled for both organizational and state-level characteristics that might affect the relationship between my dependent variable (SO_2 emissions) and independent variables. First, I controlled for facility characteristics that are closely related to facilities' SO_2 emissions in a given year t. All variables at the facility level are from the CAMD. In line with my dependent variable, I used the average of unit-level information to construct variables at the facility level. This allowed us to adjust the effect of unit capacity in a given facility. For this reason, in my analysis I did not control for the number of units installed in each facility.

To begin, I created a dummy variable indicating the past polluting behavior of a given facility. Based on the total distribution of pollution at time t-1, I created five categories of polluters: top 20 percent polluters, moderately high polluters (20–40 percent), moderate polluters

(40–60 percent), low polluters (60–80 percent), and lowest polluters (<20 percent). I also controlled for logged operation time, or the total hours that a given facility operated in a given year. The size of facility is measured as heat input (MMBtu). This measure is the amount of fuel consumed for producing electricity weighted by the heat generated from the source of energy. I adopted this variable as an indicator of facility size because it is widely used by economists and environmental science journals. Moreover, the measure is highly correlated with the amount of electricity generated by a given unit (0.989). This means that a facility with high heat input and low operating time represents a high level of operational efficiency. I also controlled for the average age of units in a facility. Because one way to reduce emissions is to install filters (scrubbers) on each unit, I controlled for each facility's installation rate of filters (number of units with filters/ Σ number of units). Although the CEMS continuously records a facility's operations, the ARP also allowed facilities to voluntarily report their operational information to the EPA. If a facility reported its operational information every single month in a given year, I viewed this as the facility's effort to comply with environmental regulations.

Under the ARP, plants' emissions of nitrogen oxide (NOx), another source of acid rain, were regulated through an emission rate limit. Similar to a traditional regulatory approach (command-and-control), plants affected by the NOx aspect of the ARP were to demonstrate that they complied with the NOx provisions at the end of the year. That is, each year facilities were required to provide evidence to the EPA that the level of their NOx emissions was below the standard. To adjust the effect of other regulatory characteristics of the ARP that did not involve any market characteristics (e.g. NOx emissions), I controlled for the average amount of NOx produced by units in a facility in year t.

To examine whether reserved allowances in the prior year (t-1) affected facilities' emissions in year t, I considered how much each facility reserved its allowances (ton/unit) in year t-1 for future usages. I also controlled for the average amount of money (in dollars) that the facilities gained each year from the public auction. To supply the auctions with allowances, the EPA held an Auction Allowance Reserve of approximately 2.8 percent of the total annual allowances allocated to all units in March of each year. The purpose of the allowance auction was to inform the market value of an allowance in a given year t for all market participants, including coal-fired facilities. Therefore, the measure is an indicator of monetary value combined with allowances that were initially allocated by the EPA. Because facilities' data were updated at the end of the year, I controlled for the dollar value of allowances each facility gained in year t rather than year t-1, as operational decisions in year t were mostly affected by the auction result in year t.

In addition, because some facilities were able to transfer their operational assets, such as allowances and raw materials, to other facilities for various reasons, I controlled for the total number of facilities that were connected to a focal facility through ownership. Higher connectedness implies that a facility had more channels for either sending or receiving operational assets, including allowances, at a lower transaction cost. To control for ownership structure, I included whether a facility was owned by a single entity or not (dummy coded), as a complex ownership structure could affect operational decision-making processes (Lee and O'Neill, 2003). Because some facilities were operated by multiple operators, I also controlled for the total number of operators associated with a focal facility, assuming that facilities operated by a single operator were more likely to respond promptly to environmental changes.

State-level control variables were lagged to adjust the effect of my independent variables on SO_2 emissions. The general state-level characteristics were obtained from the Bureau of Labor Statistics. At the state level, I considered two aspects of size, controlling for land area (in square miles) and total population (in millions). In addition, I controlled for the unemployment rate and gross state product (GSP; measured in millions of U.S. dollars) to reflect a state's economic conditions because more affluent states either may require more coal-fired facilities or may have powerful citizens who might suppress coal-fired power plants' operations (Lyon and Yin, 2010).

Obtaining data from the EIA and the EPA, I additionally controlled for energy-market and air-quality factors that could potentially affect plant operations. Since states' pollution levels could influence local governments or citizens to oppose coal-fired facilities' operations (Sine and Lee, 2009), I controlled for state air pollution in year t-1. To measure the air quality of a given state, EPA collected data from its monitoring locations and created an Air Quality Index (AQI). Using the index, the measure counts the average number (in hundreds) of violations a given state made every day by exceeding the EPA's compliance level suggested in the National Air Quality Standards.[27]

In a similar vein, I controlled for the total number of facilities in a given state, as higher density increases not only the level of pollution but also the visibility of coal-fired facilities to local stakeholders and SMOs. Assuming that coal-fired facilities not only faced competition from electricity providers of natural gas but also had the opportunity to switch their fuels from coal to natural gas, I controlled for the price of natural gas and coal in the electric power sector of a given state (million dollars per BTU). I controlled for the total amount of electricity

[27] The EPA tracked various pollutants such as SO_2, nitrogen dioxide, ozone, and carbon monoxide from its monitoring locations in a given state. My measure is the number of violations identified by the EPA.

produced from natural gas (GWh) in a given state, as coal-fired facilities competed with plants producing electricity from natural gas. I also controlled for electricity price (wholesale price) in tens of U.S. dollars per billion BTUs in year t-1. Assuming that facilities operating in states with easy access to low-sulfur coal have higher incentives to reduce SO_2 emissions by switching their fuels at a lower cost (e.g., transportation cost), I controlled for states that produce low-sulfur coal because some scholars suggest that the additional drop in SO_2 emissions comes from the wide use of low-sulfur coal (Schmalensee and Stavins, 2013).

Last, I controlled for the 28 states (as shown in Figure 1 in the previous chapter) under the influence of the CAIR program between 2010 and 2011. As noted, facilities operating in these states faced operational constraints in addition to the ARP, as the CAIR mandated that these facilities further reduce SO_2 and NOx emissions. In my analysis, I examined whether implementation of the CAIR, a legally crippled rule which threatened the perceived effectiveness of the market-based policy, had a significant impact on coal plants' SO_2 emissions. In Table 2, I summarize variables included in the analysis.

Table 2. Variables Descriptive

	Variable	Level	Time	Description
1	SO_2 (tons)	Facilty	t	average unit emissions (ton /unit)
2	L1.pollution category		t-1	past emissions category (1:Bottom 20 % ~ 5: Top 20 % Polluters)
3	NoX (tons)		t	average unit emissions of Nitrogen Dioxide
4	Heat input (mmBTU)		t	The amount of fuel consumed for producing electricity weighted by the heat generated from the source of energy (MMBTU)
5	Facility age		t	average unit age (years)
6	Logged operating time		t	average unit operating hours
7	L1. banked allowances		t-1	allowances preserved in year t-1 which can be used in year t by the focal facility
8	Auction ($)		t	money gained from the auction in March
9	SO_2 controls (ratio)		t	# units with filters/ total # of units
10	Voluntary report (binary)		t	whether a gvien facility voluntarily reported their emissions to the EPA every month
11	# connected facilities		t	# of facilities connected through ownership
12	Single owner (binary)		t	facility owned by a single owner
13	Land area (square miles)	State	time invariant	state size
14	L1. total population (millions)		t-1	state population
15	L1.GSP (state)		t-1	state GDP
16	L1.unemployment		t-1	unemployment rate
17	L1.natural gas price($MBtU)		t-1	natural gas price in a given state
18	L1.elec. natural gas (GWh)		t-1	electricity produced from natural gas
19	L1.coal price($MBtU)		t-1	average price of coal in a given state
20	L1. elec. price ($)		t-1	average electricity price in a given state
21	L1.air quality (in hundreads)		t-1	the average number (in hundreds) of daily violations a given state made by exceeding the EPA's compliance level. (when the number of any of all air pollutants identified by the EPA.
22	# facilities (state)		t-1	the total number of facilities in a given state in year t-1
23	Low sulfur coal (state)		time invariant	states that produce low sulfur coal
24	CAIR states		2010-2011	states affected by the CAIR during 2010 and 2011
25	L1. S. Club membership		t-1	membership in thousands
26	L1. Citizen's ideology		t-1	Berry's measure of political ideology. Surveyed by interest groups
27	L1.RPS		t-1	whether a given state has implemented the RPS in time t-1
28	L1. LCV Score		t-1	% of votes related to proenvironmental policies (House+Senate)

CHAPTER 5.

ANALYSIS & RESULTS

5.1 Analysis

As noted, my hypotheses tested how the influence of state-level sociopolitical context on emissions changed over time, in particular before and after 2009, the year when the removal of the CAIR from the ARP was finally enacted. Using an integrated and multilevel theory that considers the contingent and interactive effects of institutional characteristics at the state level (Soule and Olzak, 2004; Schneiberg and Lounsbury, 2008), I expected to find that regional norms that buttress pro-environmentalism have a significant impact on coal-fired power plants' SO_2 emissions. To test my hypotheses in this study, I used a two-level random-coefficient model with maximum likelihood methods. The multilevel models allowed us to investigate the effect of regional contexts while adjusting the effect of variables at the facility level. My models estimated fixed-effect regression coefficients at the facility level with random intercept terms at higher levels. The assumption is that between-unit variables at each level are higher than those observed within units (Rabe-Hesketh and Skrondal, 2008). According to Lee and Lounsbury (2015: 858), "mixed-effect analyses model the between-unit variability as a random intercept and estimate fixed-effect coefficients while taking the between-unit heterogeneity into account." Another advantage of using hierarchical linear models is that doing so allows researchers to examine time-invariant variables such as land area or states with low-sulfur coal.

Additionally, I used random slope of time for each facility and state, assuming that facilities and states responded differently to the regulatory environment over time. While the linear regression model assumes that all individual facilities and states come from a population with a single slope, the random-coefficient model relaxes this assumption by allowing the slope

to vary across my observations and to be predicted by other covariates (Hildreth and Houck, 1968; Johnston, 1984; Singer and Willet, 2003; Swamy, 2012). By allowing for a random slope of time for each facility and state, I allow the effect of time (i.e., the slope) on my dependent variable to vary freely across facilities and states, which is more realistic in the case of the ARP. Furthermore, I used a time-trend variable to adjust the effect of technological developments and the increase of stakeholder demands associated with emission reduction during my study period. I then used facility fixed-effects models to examine whether my results are consistent.

Last, to confirm the temporally discontinuous effects of key variables (Sierra Club members, citizen ideology and RPS) related to the vacating of the CAIR, I conducted two robustness checks. First, in my analysis, I interacted the year measure (time trend) with my independent variables to adjust the effect of change over time. Second, as previously noted, I initially argued that the legitimate cut-point is the year 2009, because in 2010 not only did the Obama administration decide to drop the CAIR from the ARP but also the price of an allowance fell below that of operating scrubbers. As a robustness test, I ran additional models by using a different cut-point, for instance in 2006, when the price of an allowance dropped significantly (but was still above the operating cost of filters) as a result of lawsuits by various stakeholders.

5.2 Results

As shown in the previous chapter, between 2003 and 2011, facilities maintained a reduction in their emissions even after the legitimacy of the ARP was largely challenged. The SO_2 emissions per unit declined steadily during our study period even after 2009. Table 3 presents the means and standard deviations for all study variables. Table 4 presents the intercorrelations between our key variables and controls. The correlation between Sierra Club membership and citizens'

political ideology is 0.469. Admittedly, these variables may be conceptually highly correlated because environmental movement organizations may easily mobilize participants in politically liberal states (Dunlap et al., 2001). However, the correlations between these variables are not high enough to raise concerns about multicollinearity. Similarly, states that have strong environmental movements and that are politically liberal are more likely to implement RPSs; the correlations between these variables are 0.391 and 0.364, respectively. The positive correlation between monetary gains from the allowance auction and SO_2 emissions (0.492) comes from the number of allowances that each facility received from the EPA in a given year *t*.

As expected, the LCV score is highly correlated with state political ideology (0.707), as lawmakers in states with politically liberal citizens are pressured to support pro-environmental policies (Shipan and Lowry, 2001). However, the correlation between LCV score and the implementation of the RPS is relatively low (0.327). In this respect, LCV scores may reflect the normative or cultural-cognitive dimension of the state-level sociopolitical environment better than they reflect the regulatory environment.

Table 3. Descriptive Statistics

	Variable	Obs	Mean	Std. Dev
1	SO_2 (tons)	3604	7540.71	8998.99
2	L1.pollution category	3604	2.91	1.39
3	NoX (tons)	3604	2927.23	2957.87
4	Heat input (mmBTU)	3604	20600000	18000000
5	Facility age	3604	37.67	12.57
6	Logged operating time	3604	8.79	0.49
7	L1. banked allowances	3604	7051.58	14057.9
8	Auction ($)	3604	632.78	1009.92
9	SO_2 controls (ratio)	3604	0.33	0.45
10	Voluntary report (binary)	3604	0.99	0.09
11	# connected facilities	3604	6.35	5.63
12	Single owner (binary)	3604	0.78	0.41
13	Land area (square miles)	3604	63892.59	49145.39
14	L1. total population (millions)	3604	7.69	5.56
15	L1.GSP (state)	3604	297154.6	254526.3
16	L1.unemployment	3604	6.01	2.02
17	L1.natural gas price($MBtU)	3604	6.48	1.96
18	L1.elec. natural gas (GWh)	3604	18809.5	41491.5
19	L1.coal price($MBtU)	3604	1.71	0.67
20	L1. elec. price ($)	3604	22.56	5.95
21	L1.air quality	3604	3.39	5.34
22	# facilities	3604	14.23	6.13
23	Low sulfur coal (state)	3604	0.13	0.34
24	CAIR states	3604	0.17	0.38
25	L1. S. Club membership (in thousands)	3604	13.74	9.73
26	L1. Citizen's ideology	3604	50.92	12.06
27	L1.RPS	3604	0.42	0.49
28	L1. LCV Score	3604	85.01	48.41

Table 4. Correlation Table

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	SO_2 (tons)	1													
2	L1.pollution category	0.728	1												
3	NoX (tons)	0.484	0.474	1											
4	Heat input (mmBTU)	0.502	0.502	0.766	1										
5	Facility age	-0.134	-0.111	-0.395	-0.537	1									
6	Logged operating time	0.197	0.235	0.271	0.32	-0.279	1								
7	L1. banked allowances	0.016	0.072	0.043	0.242	-0.038	0.032	1							
8	Auction ($)	0.492	0.433	0.431	0.434	-0.134	0.158	-0.069	1						
9	SO_2 controls (ratio)	-0.21	-0.243	0.183	0.309	-0.479	0.123	0.106	-0.043	1					
10	Voluntary report (binary)	0.048	0.045	0.054	0.031	0.03	0.135	0.001	0.037	-0.037	1				
11	# connected facilities	0.167	0.121	0.225	0.259	0.039	0.018	0.055	0.172	0.096	-0.003	1			
12	Single owner (binary)	-0.162	-0.167	-0.342	-0.361	0.287	-0.094	-0.088	-0.145	-0.15	-0.001	-0.481	1		
13	Land area (square miles)	0.006	0.015	0.106	0.257	-0.319	0.137	0.113	0.036	0.174	-0.011	-0.065	-0.097	1	
14	L1. total population	0.105	0.113	-0.076	0.095	-0.005	-0.018	0.116	0.078	0.036	-0.036	-0.088	0.071	0.455	1
15	L1.GSP	0.13	0.129	0.021	0.177	-0.103	0.038	0.151	0.098	0.141	-0.006	-0.024	0.005	0.535	0.732
16	L1.unemployment	-0.114	-0.117	-0.197	-0.048	0.118	-0.128	0.284	-0.261	0.088	-0.043	0.007	0.063	-0.041	0.131
17	L1.natural gas price($MBtU)	-0.003	0.031	-0.103	-0.06	0.102	-0.079	-0.042	0.185	-0.022	-0.01	0.026	0.022	-0.125	0.027
18	L1.elec. natural gas (MnKWh)	0.084	0.133	0.053	0.251	-0.247	0.066	0.197	0.072	0.14	-0.02	-0.16	-0.029	0.798	0.738
18	L1.coal price($MBtU)	-0.098	-0.103	-0.222	-0.086	0.17	-0.148	0.155	-0.15	0.041	-0.043	-0.111	0.043	0.052	0.508
19	L1. elec. price ($)	-0.058	-0.017	-0.152	-0.047	0.066	-0.097	0.239	-0.165	0.055	-0.012	-0.074	0.039	-0.135	-0.015
21	L1.air quality	0.137	0.092	0.064	0.032	0.084	-0.018	-0.106	0.127	-0.095	0.013	0.002	0.092	-0.223	-0.148
22	# facilities	0.087	0.049	-0.17	-0.082	0.148	-0.05	-0.065	0.012	-0.08	-0.023	0.009	0.142	0.014	0.402
23	Low sulfur coal (state)	-0.041	-0.078	0.013	0.012	-0.06	0.006	-0.041	-0.009	0.208	-0.002	0.066	0.037	-0.047	-0.316
24	CAIR states	-0.122	-0.124	-0.196	-0.037	0.143	-0.166	0.344	-0.285	0.087	-0.06	0.033	0.025	-0.044	0.127
25	**L1. S. Club membership**	0.022	-0.029	-0.125	-0.06	0.105	-0.04	-0.043	0.053	-0.013	-0.025	-0.062	0.083	0.149	0.811
26	**L1. Citizen's ideology**	-0.034	-0.076	-0.175	-0.147	0.253	-0.141	-0.112	-0.007	-0.078	-0.023	-0.034	0.097	-0.228	0.214
27	**L1.RPS**	-0.088	-0.179	-0.171	-0.055	0.094	-0.08	0.027	-0.157	0.025	-0.047	-0.025	-0.03	0.299	0.258
28	**L1. LCV Score**	-0.108	-0.145	-0.154	-0.148	0.204	-0.131	-0.03	-0.138	-0.065	-0.012	-0.081	0.068	-0.29	0.029

Table 4 (continued)

	Variable	15	16	17	18	19	20	21	22	23	24	25	26	27	28
15	L1.GSP	1													
16	L1.unemployment	0.131	1												
17	L1.natural gas price($MBtU)	0.027	-0.339	1											
18	L1.elec. natural gas (MnKWh)	0.698	0.053	-0.045	1										
18	L1.coal price($MBtU)	0.286	0.263	0.137	0.338	1									
19	L1. elec. price ($)	0.161	0.327	0.145	0.054	0.312	1								
21	L1.air quality	-0.081	-0.093	0.021	-0.18	-0.285	-0.075	1							
22	# facilities	0.295	0.205	0.037	0.058	-0.163	-0.159	0.255	1						
23	Low sulfur coal (state)	-0.196	-0.003	-0.032	-0.148	-0.33	-0.144	0.253	0.071	1					
24	CAIR states	0.118	0.767	-0.336	0.086	0.317	0.43	-0.115	0.114	-0.037	1				
25	**L1. S. Club membership**	0.481	0.066	0.067	0.368	0.557	-0.127	-0.177	0.304	-0.268	-0.024	1			
26	**L1. Citizen's ideology**	0.147	-0.046	0.331	-0.082	0.466	0.06	0.234	0.123	-0.143	-0.045	0.469	1		
27	**L1.RPS**	0.222	0.117	0.066	0.224	0.488	-0.022	-0.152	0.087	-0.193	0.169	0.391	0.364	1	
28	**L1. LCV Score**	0.114	0.101	0.053	-0.165	0.393	0.19	0.174	-0.023	-0.101	0.144	0.707	0.327	0.283	1

Table 5 presents the results of our hierarchical linear models with random slope of time examining the effects of state-level characteristics on SO_2 emissions per unit. Model 1 is the baseline model, which contains all facility- and state-level variables for the whole study period (2003–2011). At the state level, apart from the influence of Sierra Club membership, the baseline model shows that the association between facilities' SO_2 emissions and the main effects of variables measuring state-level sociopolitical contexts are statistically insignificant throughout our study period (all else being equal). Whereas facilities operating in highly populated states increased their emissions, those operating in states with higher levels of electricity generation from natural gas were more likely to reduce their emissions.

At the facility level, as expected, larger and dirtier facilities (facilities operating longer or having high levels of NOx emissions) generated more pollutants. However, the auction variable indicates that facilities that gained more financial assets from the public auction were more likely to produce emissions. This is because the variable captured the effect of initial allocation of allowances from the EPA based on historical data rather than the effect of monetary incentives. Since larger and dirtier facilities received larger amount of allowances from the EPA, those facilities with a greater initial allocation were more likely to produce SO_2. Nonetheless, the total amount of reserved allowances in year t-1 which also partly captures the potential value of an allowance was not significantly associated with SO_2 emissions.

Facilities with a higher rate of filter installation, all else being equal, decreased their emission levels. As intended by the ARP, older facilities reduced their emission levels as a result of additional operating costs arising from low efficiencies and managing allowances (Chan et al., 2012). The ownership variable indicates that facilities with more sibling plants or facilities with a single

Table 5. Hierarchical Mixed-Effect Analysis: Dependent Variable (DV): SO_2 Emissions

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Time (2003–2011)	7.972	11.30	-16.13	-4.041	-304.3	-316.7	-99.74	-156.1	-6.568	-32.74
	(84.33)	(83.95)	(105.04)	(105.45)	(160.87)	(163.50)	(103.76)	(106.79)	(86.88)	(89.62)
Post 2009	-604.6	-240.5	-217.8	-346.6	1022.5	1393.8	178.3	479.9	-188.2	-49.84
	(490.49)	(489.75)	(492.87)	(509.62)	(841.24)	(856.26)	(586.49)	(597.68)	(508.99)	(535.94)
L1. S. Club membership	-129.0**	-152.3**	-159.9**	-163.8***		-141.7**		-144.0**		-151.3**
	(44.34)	(46.68)	(49.68)	(49.70)		(45.51)		(44.86)		(46.34)
Time x L1. S.Club			2.269	1.582						
			(5.18)	(5.25)						
Post2009 x L1. S.Club (H1)		**-38.51***	**-40.23***	**-38.02***						
		(18.34)	**(18.74)**	**(18.80)**						
L1. Citizen's ideology	-13.01			-11.29	-33.87*	-29.96				-10.97
	(10.30)			(10.37)	(16.41)	(16.54)				(10.34)
Time x Citizen's ideology					7.081*	6.128*				
					(2.92)	(2.99)				
Post2009 x C. Ideology (H2)					**-32.03***	**-37.36****				
					(13.23)	**(13.42)**				
L1. LCV Score							-6.048	-6.266		
							(4.42)	(4.45)		
Time x LCV score							1.697*	1.700		
							(0.86)	(0.88)		
Post2009 x LCV score (H2')							**-7.711***	**-8.886****		
							(3.13)	**(3.18)**		
L1. RPS	347.6			335.7		261.7		265.2	-361.5	-109.1
	(245.29)			(248.10)		(248.77)		(249.17)	(440.73)	(451.20)

Table 5 (Continued)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Time x L1. RPS									153.0	124.9
									(85.71)	(87.11)
Post2009 x RPS (H3)									**-680.0***	**-863.1****
									(317.70)	**(324.83)**
L1.pollution category	1005.5***	1010.0***	1011.0***	1013.4***	1028.3***	1013.9***	1027.9***	1014.9***	1025.9***	1009.7***
	(82.70)	(82.71)	(82.75)	(82.79)	(82.51)	(82.65)	(82.57)	(82.68)	(82.68)	(82.71)
NoX (tons)	0.445***	0.448***	0.447***	0.446***	0.451***	0.449***	0.446***	0.445***	0.452***	0.449***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Heat input	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***	0.0002***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Facility age	-108.6***	-107.7***	-107.7***	-107.5***	-107.0***	-106.5***	-107.8***	-107.5***	-109.1***	-108.2***
	(18.01)	(18.04)	(18.04)	(18.04)	(18.03)	(18.03)	(18.00)	(17.99)	(18.02)	(18.03)
Logged operating time	611.2***	602.7***	603.1***	609.5***	588.0***	612.0***	571.6***	598.7***	579.1***	608.1***
	(144.83)	(144.75)	(144.75)	(144.77)	(144.84)	(144.92)	(144.70)	(144.80)	(144.71)	(144.83)
L1. banked allowances	0.004	0.004	0.004	0.004	0.003	0.003	0.003	0.004	0.004	0.003
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Auction	0.701***	0.701***	0.702***	0.710***	0.672***	0.722***	0.663***	0.718***	0.664***	0.716***
	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Filter installation rate	-10092***	-10101***	-10102***	-10082***	-10077***	-10081***	-10082***	-10082***	-10093***	-10100***
	(319.00)	(319.34)	(319.34)	(319.29)	(319.03)	(318.95)	(319.08)	(318.93)	(319.21)	(319.13)
Voluntary report	-320.1	-316.9	-313.0	-324.9	-340.0	-312.9	-289.3	-246.8	-312.8	-309.4
	(538.45)	(537.90)	(537.94)	(538.14)	(538.31)	(537.61)	(538.45)	(537.86)	(538.36)	(537.90)
# connected facilities	-65.88**	-65.91**	-65.77**	-66.24**	-63.57**	-64.49**	-61.70**	-61.81**	-64.06**	-65.90**
	(21.53)	(21.53)	(21.53)	(21.53)	(21.54)	(21.53)	(21.54)	(21.52)	(21.53)	(21.53)

TABLE 5 (Continued)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Single owner	-712.8**	-763.9**	-766.6**	-748.1**	-728.1**	-747.3**	-712.5**	-730.0**	-699.6**	-728.3**
	(256.11)	(256.38)	(256.43)	(256.62)	(255.94)	(256.11)	(256.44)	(256.61)	(256.26)	(256.15)
Land area (square miles)	-0.009	-0.007	-0.006	-0.009	-0.003	-0.009	-0.003	-0.010	-0.004	-0.008
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
L1. total population	632.6***	713.3***	706.6***	728.3***	404.4***	657.9***	392.3***	638.6***	430.9***	727.5***
	(140.64)	(148.91)	(150.08)	(150.73)	(118.12)	(144.08)	(116.45)	(139.97)	(118.64)	(147.81)
L1.GSP	0.00181	0.00133	0.00124	0.00140	0.00183	0.00219	0.00172	0.00210	0.00133	0.00162
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
L1.unemployment	157.2	170.4*	171.9*	162.8*	198.0*	123.6	195.0*	118.4	189.0*	120.1
	(81.06)	(81.04)	(81.14)	(81.39)	(78.67)	(82.63)	(78.77)	(82.61)	(79.51)	(82.86)
L1.natural gas price	-89.65	-86.21	-86.85	-87.38	-83.28	-68.25	-103.0*	-87.35	-101.7*	-83.95
	(46.15)	(46.13)	(46.15)	(46.20)	(46.27)	(46.72)	(46.47)	(46.99)	(45.96)	(46.25)
L1.elec. natural gas	-0.051***	-0.054***	-0.054***	-0.054***	-0.046**	-0.054***	-0.043**	-0.050***	-0.046**	-0.059***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)
L1.coal price	-7.047	-6.556	-9.845	-18.07	-14.35	-12.04	-11.44	-10.14	-31.39	-20.25
	(35.29)	(34.16)	(34.91)	(36.11)	(34.23)	(35.80)	(34.54)	(36.31)	(35.78)	(36.24)
L1. elec. price	254.4	155.9	176.6	241.7	180.8	165.6	211.4	177.1	276.0	246.8
	(300.98)	(298.41)	(302.32)	(307.40)	(301.52)	(306.97)	(295.84)	(300.13)	(299.41)	(308.45)
L1.air quality	22.07	34.16	34.07	30.35	37.71	23.05	29.37	13.72	24.31	18.13
	(28.99)	(28.98)	(28.99)	(29.33)	(28.61)	(29.11)	(28.50)	(28.99)	(29.27)	(29.48)
# facilities	-104.5	-120.6	-119.1	-123.0	-106.0	-113.7	-98.27	-101.5	-109.6	-122.8
	(65.58)	(67.16)	(67.34)	(67.23)	(66.41)	(66.65)	(65.86)	(65.69)	(66.68)	(67.34)
Low sulfur coal (state)	3148.4*	3164.6*	3132.9*	3241.2*	2855.9*	3187.6*	2868.5*	3169.7*	2937.7*	3243.4*
	(1288.54)	(1323.47)	(1329.19)	(1325.88)	(1295.81)	(1308.19)	(1285.48)	(1284.01)	(1299.37)	(1320.41)

Table 5 (Continued)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
CAIR states	-456.8	-199.5	-202.1	-238.6	-176.9	-111.2	-365.3	-361.6	-407.9	-388.6
	(347.22)	(363.08)	(363.25)	(364.03)	(370.38)	(373.44)	(348.46)	(350.52)	(347.48)	(348.19)
Constant	1972.7	1442.2	1604.7	2207.9	2414.3	3012.5	1425.2	2287.8	1491.1	2397.0
	(2083.68)	(2056.36)	(2089.79)	(2121.39)	(2149.07)	(2171.27)	(2073.69)	(2106.16)	(2067.85)	(2099.83)
# of facilities	3604	3604	3604	3604	3604	3604	3604	3604	3604	3604
# of states	43	43	43	43	43	43	43	43	43	43

Standard errors in parentheses

†<0.10, * p<0.05, ** p<0.01, *** p<0.001

owner reduced their emission levels more than others during our study period. Explaining this relationship requires further investigation. One explanation could be that facilities with a single owner or with multiple sibling plants are more sensitive to the price of an allowance; for instance, the former (with a single owner) might have perceived higher operational risks from noncompliance, as they were completely responsible for plant operation. On the other hand, the latter might have taken advantage of the market more actively as a result of their ample allowance-trading channels. However, the relationship between these variables is beyond the scope of this study.

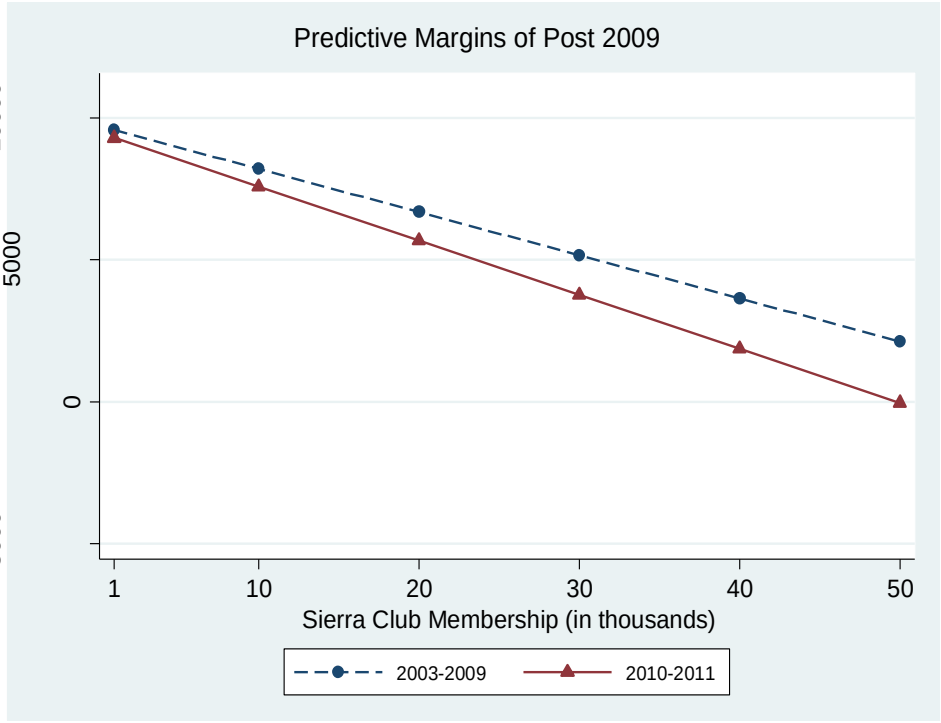
In Models 2 through 10, I added a dummy variable (post-2009) to assess how the influence of state-level sociopolitical contexts on SO_2 emissions changed during different time periods (pre- and post-2009). Model 2 presents the effect of Sierra Club membership on emissions pre- and post-2009. In line with hypothesis 1, I found that the relationship between Sierra Club membership and plants' SO_2 emissions was negative after 2009. A one-standard-deviation increase in Sierra Club membership decreased SO_2 emissions by 27 percent. This relationship was supported even after adjusting for the effect of Sierra Club membership on emissions over time (Time × Sierra Club) as shown in Model 3. In other words, rather than the general growth trend of Sierra Club membership at the state level, the direct influence of club members on emissions was stronger when the ARP was legally challenged. As shown in Model 4, this relationship was significant even after adjusting the effect of other formal and informal state-level sociopolitical contexts such as citizen's political ideology and the influence of the RPS.

Model 5 presents whether the influence of state-level citizens' political ideology on coal-fired facilities' environmental performance shifted after 2009. According to Model 1, which excluded the pre-post indicator, local citizens' political ideology had no significant effect on emissions. In Model 5, however, the influence of local political ideology on emissions, as hypothesized (H2), increased after 2009 even after adjusting for the influence of citizens' ideology over time (Time × Citizen's ideology). I estimate that a one-standard-deviation increase in citizens' political ideology reduced a facility's emissions by 11 percent. In other words, higher state-level liberalism suppressed coal power plants' emissions more strongly when the market-based policy was perceived as ineffective. Assuming the rigidity of political ideology at the state-level, I suggest that coal-fired facilities become more responsive to local citizens' demands. As shown in Model 6, this relationship was also significant after adjusting the effect of Sierra Club membership and RPSs at the state level. Similarly, as shown in Model 7 and Model 8, lawmakers' voting for pro-environmental policies also had a stronger influence on the reduction of SO_2 emissions after 2009.

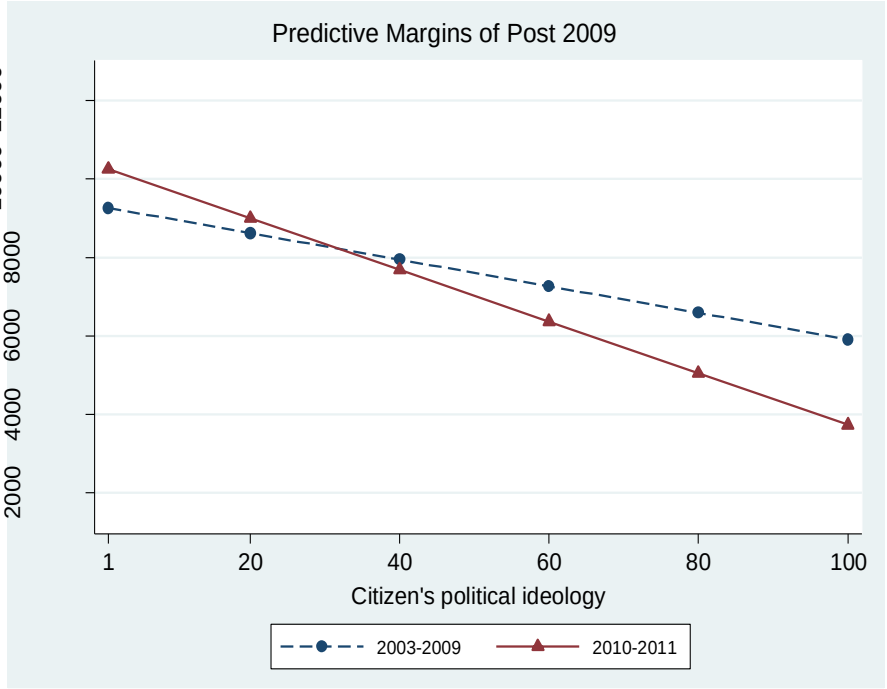
In Model 9, as hypothesized (H3), state-level regulation associated with pro-environmentalism (RPSs) had a stronger negative impact on facilities' emissions after 2009, when the ARP lost validity to the point where it could be ignored in practice. As noted, this relationship was supported even when citizens' political ideology was considered in the model (Model 10). These results are also demonstrated in Figure 11. As shown, the negative slope is steeper after 2009, all else being equal. The interaction graphs show that both formal and informal sociopolitical contexts at the state level had a greater impact on locally operated organizations when the society-wide (or federal) regulatory environment was no longer perceived as an effective tool for organizations to secure their own legitimacy and stable

operations. Overall, our results show that coal-fired facilities became more responsive to local (state-level) sociopolitical pressures related to pro-environmentalism when the federal policy was perceived as ineffective.

Pre-Post (2009) analysis: The influence of Sierra Club membership (state-level) on SO_2 emissions (H1).



Pre-Post (2009) analysis: The influence of state citizens' political ideology on SO_2 (H2).



Pre-Post (2009) analysis: The influence of RPS on SO_2 emissions.

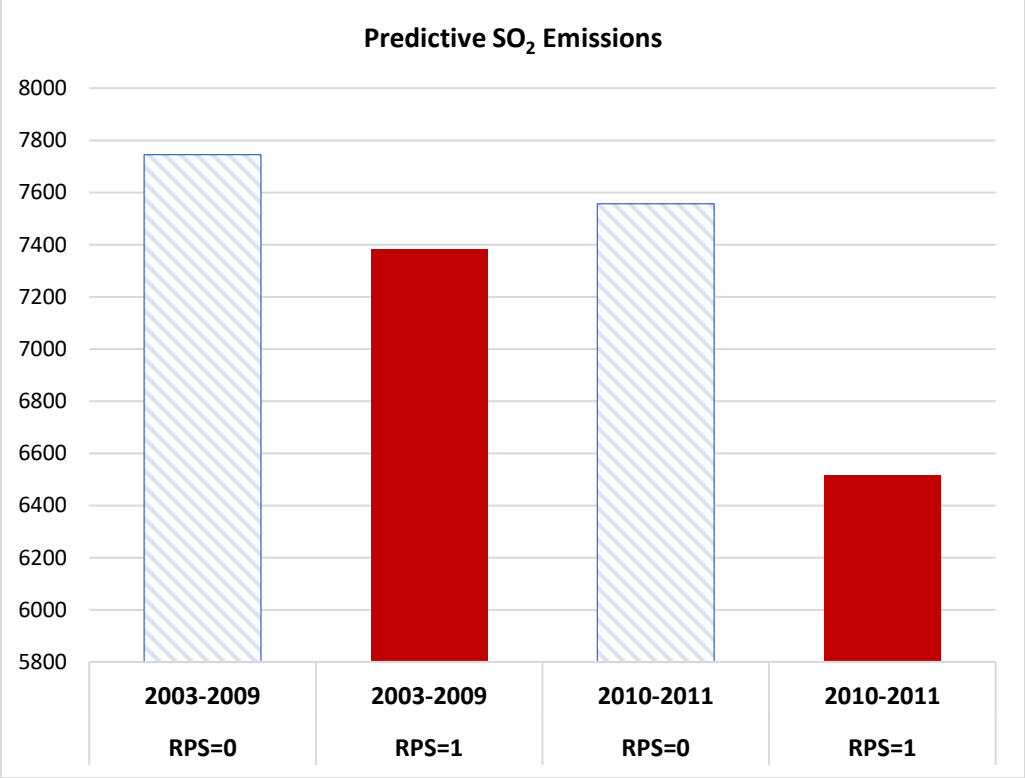


Figure 11. Interaction Graphs

I then tested the robustness of our results with the facility fixed-effects models, presented in Table 6. In this analysis, I dropped land area and low-sulfur-coal-producing states, as fixed-effects models are not appropriate for examining time-invariant variables. As noted, in addition

Table 6. Facility Fixed-Effects Models: DV: SO_2 Emissions

Variables	**Model 11**	**Model 12**	**Model 13**	**Model 14**
L1. S. Club membership	-185.8**	-193.7**	-123.3*	-151.3*
	(66.39)	(66.53)	(61.35)	(59.41)
Time x L1. S.Club	-0.061	-1.10		
	(3.80)	(4.10)		
Post2009 x L1. S.Club (H1)	**-53.42***	**-51.96***		
	(24.20)	**(24.21)**		
L1. Citizen's ideology		-29.36*	-34.02*	-29.65*
		(12.29)	(15.31)	(12.30)
Time x Citizen's ideology			2.667	
			(2.76)	
Post2009 x C. Ideology (H2)			**-28.56†**	
			(16.94)	
L1. RPS		231.6	93.81	176.2
		(256.94)	(243.81)	(359.08)
Time x L1. RPS				35.40
				(71.92)
Post2009 x RPS (H3)				**-925.5***
				(398.25)
Controls	**YES**	**YES**	**YES**	**YES**
Constant	6102.5†	7885.5*	7982.7*	8318.5*
	(3282.17)	(3364.09)	(3433.73)	(3416.26)
# of facilities	3604	3604	3604	3604
# of states	43	43	43	43

Standard errors in parentheses
†<0.10, * p<0.05, ** p<0.01, *** p<0.001

to the influence of SMOs, the main effect of citizens' political ideology was negatively associated with facilities' emissions throughout our models. Importantly, the results of the fixed-effects models are consistent with those of the two-level random-coefficient model; specifically, the influence of formal and informal sociopolitical contexts (political ideology, SMO members, and the implementation of RPSs) on coal-fired facilities' SO_2 emissions (Models 11–14). In particular, the influence of Sierra Club membership had stronger influence on coal-fired facilities after 2009 with or without adjusting the effect of other variables measuring state-level sociopolitical contexts. The results of the fixed-effects models also support the hypotheses that organizations are likely to respond to their local sociopolitical contexts when a federal policy is regarded as ineffective.

Last, it is important to confirm that our measure of "perceived ineffectiveness (post-2009)" is accurate. As noted, I define perceived ineffectiveness as occurring when key premises of the federal ARP policy are questioned by stakeholders. As previously mentioned in Chapter 2, when the court initially vacated the CAIR, stakeholders and government officials believed that the EPA would appeal and fix the questionable policy. However, Obama administration dropped the CAIR from the ARP in 2010, and stakeholders started to question the continuous use of market mechanisms at the federal level. As previously mentioned, stakeholders and local governments expected that the EPA would revise concerns raised by the Court and maintain the CAIR. When the CAIR was finally decided to drop out from the ARP, a number of politicians and public media publicized the end of cap and trade era. In this vein, John Broder (2010), one of the editors at The New York Times wrote as follows:

> *……the concept [of cap and trade] is in wide disrepute, with opponents effectively branding it "cap and tax," and Tea Party followers using it as a symbol of much of what they say is wrong with Washington.*

Mr. Obama dropped all mention of cap and trade from his current budget. And the sponsors of a Senate climate bill likely to be introduced in April, now that Congress is moving past health care, dare not speak its name.

"I don't know what 'cap and trade' means," Senator John F. Kerry, Democrat of Massachusetts, said last fall in introducing his original climate change plan.

Mr. Kerry's partner in promoting global warming legislation, Senator Lindsey Graham, Republican of South Carolina, pronounced economy wide cap and trade dead last month and has since been working with Mr. Kerry to try to patch together a bill that satisfies the diverse economic, regional and ideological interests of the Senate…… (New York Times, 2010 March 25)

The lack of political support was also reflected in the allowance market. The ARP was supposed to induce facilities to decrease emissions by restricting the supply of allowance (the cap component of the program) and maintaining the price of allowances above a certain level (higher than the cost of operating filters) via a robust market. However, in 2009 the Obama administration dropped the CAIR from the ARP, which led stakeholders to question the continuous use of market mechanisms. After a series of legal challenges to the CAIR, the price of an allowance became—and remained—lower than that of operating the cheapest filters after 2009. This meant that coal-fired facilities had economic incentives to stop operating the more expensive filters and to increase emissions by consuming cheaper allowances. As noted, this was clearly contrary to the original purpose of the ARP program but was technically allowed. Consequently, it became clear to all parties involved that the market no longer provided a socially acceptable mechanism to reduce SO_2 emissions.

To further test this claim, I conducted additional pre- and post-analyses with different cut-off points as shown in Table 7. First, I compared the influence of our independent variables between period 1 (2003–2005) and period 2 (2006–2011). I chose 2005 as a cut-off point because the state of North Carolina first sued the EPA in 2006 (models 15–17). During this

period, the price of an allowance was still significantly higher than that of operating filters. In the second analysis, I used 2008 as a cut-off point (models 18–20) because the D.C. Circuit initially vacated the CAIR and asked the EPA to revise the program. Using the hierarchical mixed model

Table 7. Hierarchical Mixed-Effect Analysis with Different Time Periods (DV: SO_2 Emissions)

Variables	**Post=2006–2011**			**Post=2008–2011**		
	Model 15	**Model 16**	**Model 17**	**Model 18**	**Model 19**	**Model 20**
L1. S. Club membership	-130.8**	-132.8**	-138.4**	-129.2**	-133.0**	-125.5**
	(47.41)	(45.31)	(45.47)	(50.12)	(46.49)	(46.55)
Time x L1. S.Club	0.062			-0.63		
	(5.99)			(5.69)		
Post2009 x L1. S.Club (H1)	**-6.283**			**2.525**		
	(16.059)			**(17.204)**		
L1. Citizen's ideology	-10.21	-25.88	-9.666	-10.34	-25.85	-10.46
	(10.08)	(16.48)	(9.99)	(10.92)	(16.49)	(10.86)
Time x Citizen's ideology		0.955			5.276	
		(3.62)			(3.55)	
Post2009 x C. Ideology (H2)		**-12.57**				
		(14.98)				
L1. RPS	333.1	299.5	178.2	347.1	324.5	305.3
	(249.10)	(248.62)	(432.52)	(251.03)	(248.75)	(432.12)
Time x L1. RPS			-32.94			-39.06
			(93.14)			(94.48)
Post2009 x RPS (H3)			**364.6**			**391.2**
			(343.30)			**(345.34)**
Controls	YES	YES	YES	YES	YES	YES
Constant	1956.9	2750.5	2074.5	2088.1	2909.0	2107.3
	(2099.78)	(2150.84)	(2081.96)	(2098.49)	(2151.88)	(2073.00)
# of facilities	3604	3604	3604	3604	3604	3604
# of states	43	43	43	43	43	43

Standard errors in parentheses

†<0.10, * p<0.05, ** p<0.01, *** p<0.001

with random coefficients of time, both analyses justify our argument that the influence of state-level sociopolitical contexts on plants was not significant after these cut-off points but was significant after 2009.

In sum, the overall pattern of our results supports our hypotheses that local (state) institutional characteristics will have a stronger influence on organizations when societal-level (federal) pressures are challenged and questioned. In particular, the additional analyses show that plants were likely to respond to sociopolitical contexts at the state level when the federal policy was perceived as ineffective.

CHAPTER 6.

DISCUSSION AND CONCLUSION

Borrowing insights from the political mediation theory, I examined why targeted organizations might respond less to regional SMOs under certain conditions. Specifically, when the ARP was perceived as a valid instrument to curve SO_2 emissions (2003–2009), the influence of local sociopolitical actors was mitigated and their direct influence on target organizations was absorbed by the "legitimate" federal policy. By contrast, when the federal government finally dropped key provisions of the ARP (2010–2011), coal-fired facilities were more likely to respond to local sociopolitical pressures. These results support Zucker's (1986) insight about the substitutive relationship between formalized rules and normative frameworks shared by the members of a community. Assuming that the normative and cultural-cognitive environments serve as a mediation link for SMOs to exert influence on targeted organizations, the study extends our understanding of when and to what extent political mediation is likely to hold.

From this perspective, my research furthers our understanding of how institutional stability could be achieved when institutionalized rules, norms, and beliefs at the federal level are constantly challenged by stakeholders in the local environment. A key insight of this study is that when certain institutional elements at the societal level begin to erode,[28] institutional elements in other domains (e.g., at the local level) could replace the faltering element to prevent institutional decay. Despite the weakening of the ARP, organizations under this program continued to reduce acid rain pollutants because other institutional elements at the local level, such as local SMOs or citizens' political ideology, replaced the role of the eroding federal regulation. As Oliver (1992)

[28] Here, I assume that any type of erosion weakens the cultural-cognitive dimension. Other sources of conformity that once contributed to the institutionalization process could contribute to institutional maintenance by buttressing the cultural-cognitive dimension.

noted, a series of conditions must be satisfied for deinstitutionalization to take place. I argue that unless certain events change the common understandings and values behind a given institution at both societal and local levels, deinstitutionalization may not occur immediately.

If we view institutionalization as an objectified state that increases the cost of nonconformity through self-reproduction mechanisms, this question will be difficult to resolve. However, as Zucker (1988: 26) noted, maintaining an institutionalized state requires "continuous action" intended to maintain the existing order. Without these efforts, "institutions would simply decay into cultural artifacts" (Dacin et al., 2010: 1395). Based on institutional studies of regions, I have endeavored to explain how an institution maintains itself against the tendency to decay by introducing how local institutional characteristics replace formal policies at the federal level.

Because the processes through which institutions are maintained "remain a relatively understudied phenomenon" (Lawrence and Suddaby, 2006: 234), understanding these processes is important to expanding our knowledge of the dynamic nature of institutional elements. Although I relied heavily on statistical analyses and secondary documents, future studies could conduct more qualitative research to identify other dynamics at the global and local level. This requires rich historical data to track how each institutional element changes over time. The entropic assumption tells us that the active role of other elements to stop the decomposition process is required. I hope that my theory and findings encourage future inquiry into the dynamic nature of institutional elements.

Moreover, this study contributes to the burgeoning literature on the enduring influence of regional institutional pressures acting as a lens for organizations to interpret their overall institutional environment. In particular, my results show that the influence of regional institutional contexts on organizational behavior may depend on the legitimacy of a federal

policy. Although I show how informal institutional contexts play a role in the commitment of plants to enhance their environmental performance, my additional analyses also illustrate that organizations are more likely to respond to formal sociopolitical pressures at the regional level when stakeholders lose confidence in the federal law. Similarly, political mediation theorists have explained why successful policies can often lead to the end of associated social movements as stakeholders and other audiences concentrate on legal compliance and perceive the enactment of these policies as the natural end of movement's life cycle (Soule and Olzak, 2004; Olzak and Soule, 2009; Amenta et al., 2010).

This insight is in line with the Ostromian view (Pennington, 2012; Ostrom, 2015) on the effectiveness of decentralized authority for determining rules for governing the use of resources. According to Ostrom (2015), a centralized federal regulatory environment decreases incentives for those involved at the local level to search for ways to improve local governance. My results also suggest that relevant stakeholders are more likely to pay attention to the implementation of federal law when the law serves as an overarching framework. In other words, the legitimacy of a federal regulation absorbs and mitigates local sociopolitical influences on organizations because local stakeholders depend on its validity. In the future, more empirical studies should be conducted to clarify whether my results hold in different legal contexts.

Furthermore, this paper contributes to the non-market strategy literature (Hiatt and Park, 2013; Carlos and Lewis, 2017; Durand and Georgallis, 2017; Hiatt, Carlos, and Sine, 2017). This vigorous new strand of research has examined a wide variety of actions that organizations deploy in order to manage their political environment and extract rents outside of the market itself (Bonardi, Holburn, and Bergh, 2006; Ring et al., 2005; Hillman, Keim, and Schuler, 2004; Hillman and Hitt, 1999). The repertoire of tactics deployed by organizations include constituency

building, coalition formation, lobbying, advocacy advertising, and so forth (Oliver and Holzinger, 2008; Bonardi, Holburn, and Bergh, 2006; Hillman and Keim, 1995). While providing valuable insights, this literature has yet to examine how the nuanced dynamic between societal and local-level institutional pressures may affect the effectiveness of firm strategic efforts. This omission is important for several reasons. First, a failure to understand the substitutive role between societal and local-level institutional pressures may lead organizations to target their strategies towards the wrong sociopolitical actors. For example, my theory and empirical results suggest that in the period that the ARP was challenged (2010–2011), organizations should have shifted their attention towards managing their relationship with local (state-level) actors. Had an organization continued to focus exclusively on managing federal actors (the appropriate strategy before 2009), it would have not only wasted its efforts but possibly failed to protect itself from hostile actions by local sociopolitical actors.

Last, my theory and results have important implications for organizations operating in multiple local institutional environments. During the period when all stakeholders accepted the ARP as a legitimate mechanism to reduce SO_2 emissions, these organizations could implement a generalist compliance strategy that appeased all parties. Once the ARP came under scrutiny, these organizations would need to devise and implement a strategy better tailored to the characteristics of the different locations where they operated. A one-size-fits-all non-market strategy was no longer appropriate under these conditions. Importantly, organizations operating in multiple locations will tend to be larger than those operating in a single location. The larger size of these organizations implies that they will also experience strong inertial forces. Therefore, these organizations will tend to be slower to shift (if at all) from a generalist to a niche non-market strategy. Here, I call attention both to the need to adjust and to overcome the internal

inertial forces that will try to impede it. Future research could explore how organizations operating in multiple locations adjust their non-market strategy and whether and how their response differs from that of organizations operating in a single location.

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